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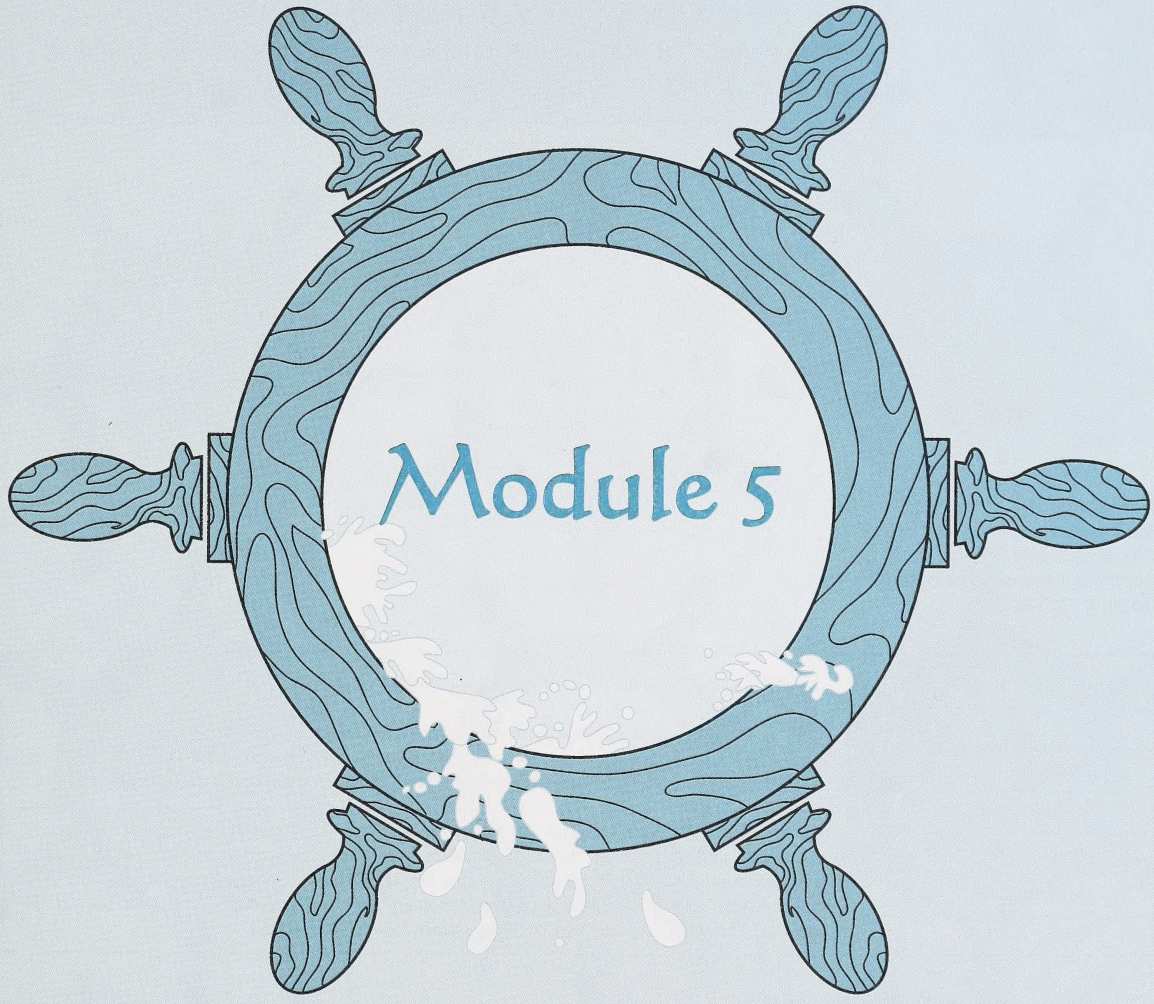
Mathematics 5

Data Analysis

Learning Technologies Branch

Alberta LEARNING

Mathematics 5



Data Analysis

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Mathematics 5
Module 5: Data Analysis
Student Module Booklet
Learning Technologies Branch
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This document is intended for	
Students	✓
Teachers	✓
Administrators	
Home Instructors	
General Public	
Other	

You may find the following Internet sites useful:

- Alberta Learning, **http://www.learning.gov.ab.ca**
- Learning Technologies Branch, **http://www.learning.gov.ab.ca/ltb**
- Learning Resources Centre, **http://www.lrc.learning.gov.ab.ca**

The use of the Internet is optional. Exploring the electronic information superhighway can be educational and entertaining. However, be aware that these computer networks are not censored. Students may unintentionally or purposely find articles on the Internet that may be offensive or inappropriate. As well, the sources of information are not always cited and the content may not be accurate. Therefore, students may wish to confirm facts with a second source.

Welcome Aboard
Mathematics 5

Ahoy! Mathematics 5 contains nine modules.
You should work through the modules in order (from 1 to 9) because concepts and skills introduced in one module will be reinforced, extended, and applied in later modules.

Adventures on the High Seas

Kassidy: Connor, guess what? I noticed an advertisement in the newspaper. A second-hand bookshop just opened, and it's supposed to have some really old books from all over the world.

Connor: Some may even be older than our great-grandparents! Let's go take a look.

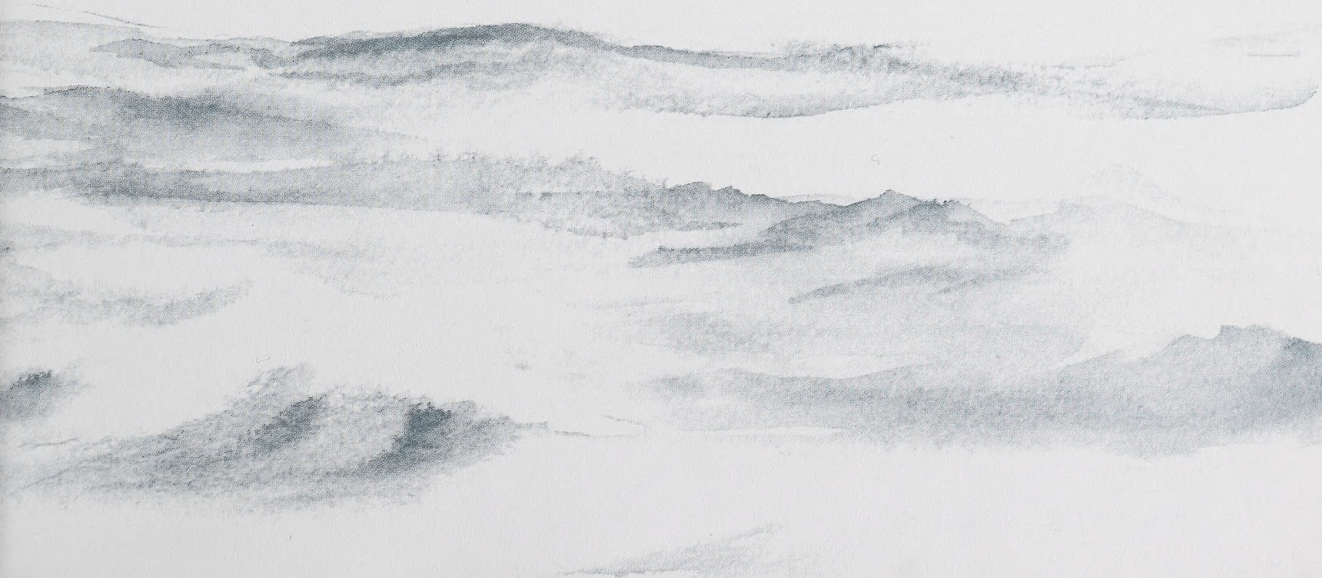
Excited about what they might find to read, Connor and Kassidy hurry off to the bookshop.

Connor: Wow! Look at this, Kassidy. Here's an actual journal kept by Captain Quinn almost 300 years ago. It's kind of musty, and parts are hard to read, but look at how much math the captain used!

Kassidy: There are also maps, descriptions of ships, and reports about sea conditions.

Connor: Let's buy it. Figuring out what the journal says will be like unravelling a mystery. Maybe it will have clues about real buried treasure.

From time to time throughout the course, you will work with many of the facts and figures about the days of sailing boats and sea captains that Kassidy and Connor discover.



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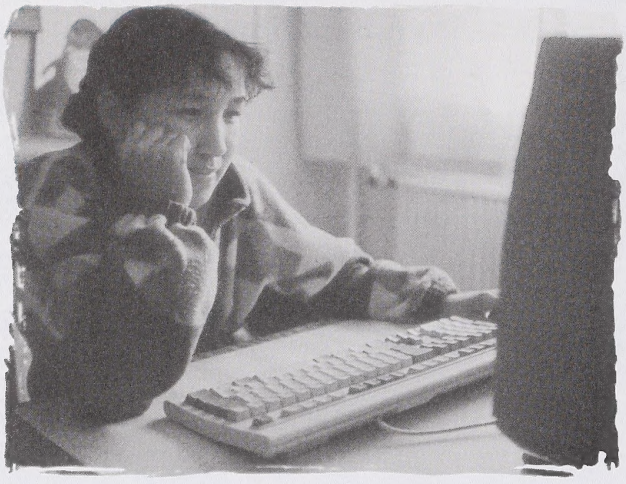
Course Features



BRYAN AND CHERRY ALEXANDER PHOTOGRAPHY

Take the time to look through the Student Module Booklet and the Assignment Booklets and notice the following design features.

- Each module has a Module Overview, Module Summary, and Review.
- Each module has several lessons. Each lesson focuses on a big idea that is central to the topic being learned in the module.
- Each lesson has several activities. An activity in each lesson is related to the high seas adventure theme. The last activity in each lesson is a Challenge Activity.
- Each module has a Glossary and an Answer Key in the Appendix. In several modules there are also special pull-out pages in the Appendix.
- Each module has special exercises that focus on certain mathematical skills. For example, The Numbers in the News project involves a scavenger hunt for samples of math in everyday life. The Keystrokes exercise introduces some "funky features" of the calculator that can be used to explore and practise important number ideas.

Required Resources

There are no spaces provided in the Student Module Booklets for your answers. This means you will need a binder and loose-leaf paper or a notebook to do your work.

In order to complete the course, you will need a copy of the Mathematics 5 textbook, *Quest 2000: Exploring Mathematics*, the soft-cover book *Quest 2000: Exploring Mathematics: Practice and Homework Book*, a basic four-operation calculator (such as the TI-108 calculator), and various manipulatives (base ten blocks and pattern blocks).

If you wish to complete the optional computer activities, you must have access to a computer that is connected to the Internet.

Visual Cues

For your convenience, the most important mathematical rules and definitions are highlighted. Icons are also used as visual cues. Each icon tells you to do something.

Use your calculator.

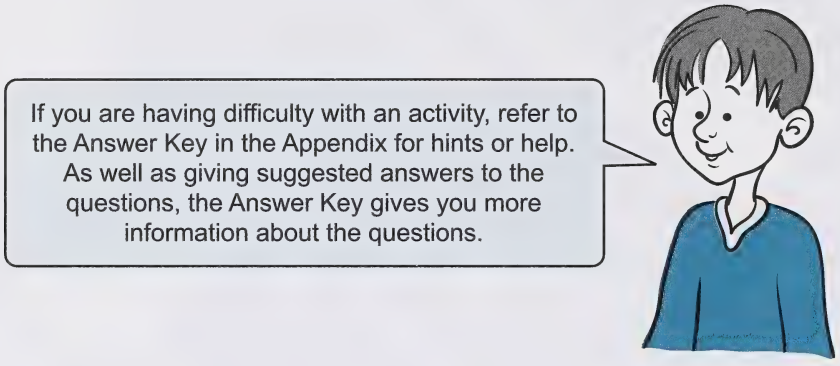
Use the Internet.

Refer to the textbook or the Practice and Homework Book.

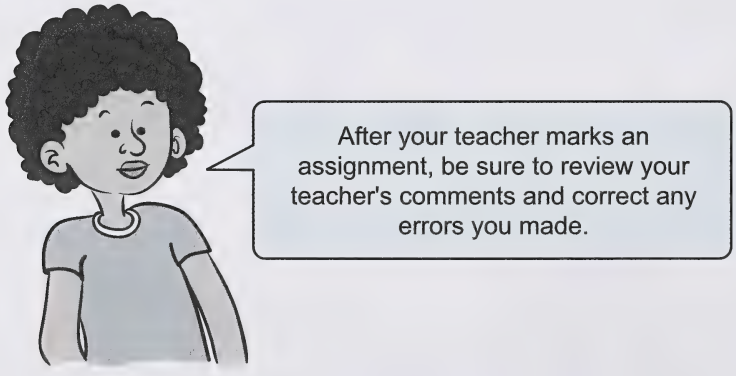
Your guides for this course are Kassidy and Connor.

Assessment and Feedback

The Mathematics 5 course is carefully designed to give you many opportunities to discover how well you are doing. In every activity you will be asked to turn to the Appendix to check your answers. Completing the activities and comparing your answers to the suggested answers in the Appendix will help you better understand math concepts, develop math skills, and improve your ability to communicate mathematically and solve problems.



Twice in each module you will be asked to give your teacher your completed assigments to mark. Your teacher will give you feedback on how you are doing.



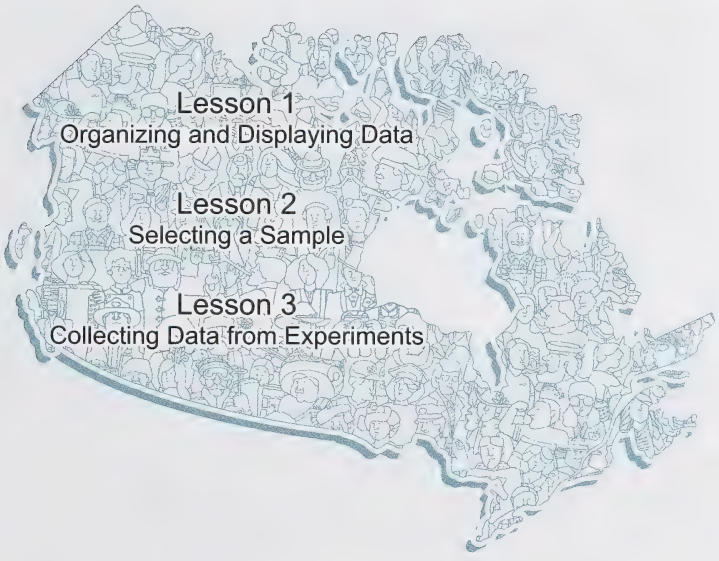
There will be a final test at the end of the course. You can prepare for the final test by completing the Review at the end of each module.

Module Overview

How many people are there in Canada? Where do they live and how do they make a living? Do you know what fraction of the population lives on the coasts or in the interior of the country? How many live in towns and cities? Governments need answers to questions like these to make plans, to make laws, and to provide services.

Have you ever wondered how governments get information about their citizens? One way is through a **census**. Every five years, the federal government in Canada conducts a census by distributing questionnaires to every household. From these questionnaires, information about each resident is gathered and recorded. The information is organized, analysed, and summarized in tables and graphs. Then this information is used to draw conclusions and make predictions.

In this module you will explore how to collect, record, organize, display, and analyse data. As part of your exploration, you will make line plots and broken-line graphs. You'll discover how you can use these graphs to illustrate various relationships among data. You will also explore how to collect data from an entire population or just a part of the population. You will also collect and display data from experiments, and you will use your results to draw conclusions and make predictions.



Your mark on this module will be determined by how well you complete the two Assignment Booklets.

The mark distribution is as follows:

Assignment Booklet 5A

Lesson 1 Assignment	30 marks
Lesson 2 Assignment	30 marks

Assignment Booklet 5B

Lesson 3 Assignment	30 marks
Numbers in the News	10 marks
Total	100 marks

When doing the assignments, work slowly and carefully. Be sure you attempt each part of the assignments. If you are having difficulty, you may use your course materials to help you, but you must do the assignments by yourself.

You will submit Assignment Booklet 5A to your teacher before you begin Lesson 3. You will submit Assignment Booklet 5B to your teacher at the end of this module.

Numbers in the News

Numbers are everywhere! Newspapers and magazines are full of stories and advertisements that show how numbers are used every day.

The following Scavenger Hunt asks you to look through newspapers and magazines for samples of number ideas like those you will be using in this module. Read through the list now and begin by collecting samples of the ideas you already understand. You may collect other samples as you learn about them in the module.

Scavenger Hunt

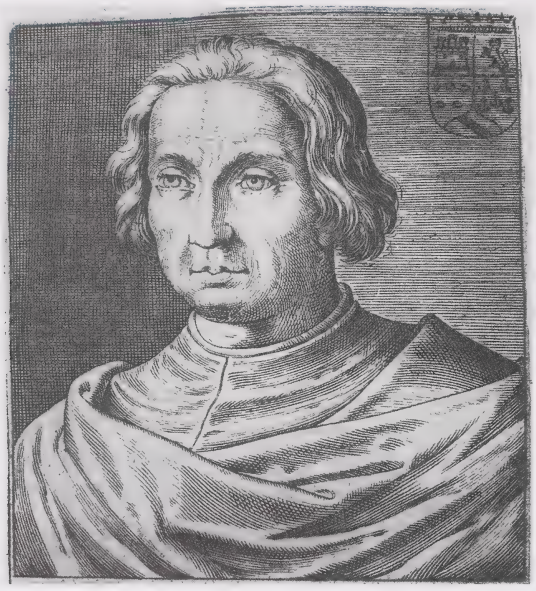
Cut out articles or advertisements from newspapers or magazines that show data and graphs being used in different situations. Here are some suggestions of things to look for:

1. bar graphs
2. broken-line graphs
3. table of data
4. articles that report the results of experiments or surveys

You will find further instructions for submitting your project in Assignment Booklet 5B.

Lesson 1

Organizing and Displaying Data



ARCHIVO ICONOGRAFICO, S.A./CORBIS

One explorer almost everyone knows about is Christopher Columbus. Columbus was born in Italy on August 3, 1446. Although he was born in Italy, he was financed by the king and queen of Spain to sail west from Palos (on the coast of Spain) to what he thought would be the East Indies. Like most educated people of his time, he knew the world was round. However, he did not know how large the world was and that he would eventually bump into the Americas instead of sailing directly to the Orient.

What Columbus lacked were facts. However, Columbus and the explorers who followed him quickly gathered details about the most direct routes to America, distances sailed, prevailing winds, and islands encountered on the way. The data they collected were summarized on maps and charts. This collection and display of data was invaluable to future travellers.

In this lesson you will explore how data from a variety of sources can be collected and displayed. You will find that by displaying data, you can discover different relationships among the data. You will make line plots and broken-line graphs when it is useful to do so. And you will interpret your graphs to solve problems.

Activity 1

Today you will use graphs to interpret **data**—information gathered for analysis.

Chart 1 on the next page shows the distances recorded in the log for Christopher Columbus's westbound passage in the fall of 1492 from the time he left the Canary Islands until he arrived at the Bahamas. The unit of distance used by Columbus was a **league**. (A league is about 5 km.)

CHART 1: COLUMBUS'S WESTBOUND PASSAGE, 1492

Date	Distance Travelled (Leagues)	Date	Distance Travelled (Leagues)
September 8	9	September 26	31
September 9	45	September 27	24
September 10	60	September 28	14
September 11	40	September 29	24
September 12	33	September 30	14
September 13	33	October 1	25
September 14	20	October 2	39
September 15	27	October 3	47
September 16	39	October 4	63
September 17	50	October 5	57
September 18	55	October 6	40
September 19	25	October 7	28
September 20	8	October 8	12
September 21	13	October 9	14
September 22	30	October 10	59
September 23	27	October 11	50
September 24	15	October 12	2
September 25	21		

The data from Chart 1 can be organized and displayed in many different ways, as shown in Charts 2 to 9.

CHART 2: COLUMBUS'S WESTBOUND PASSAGE, 1492

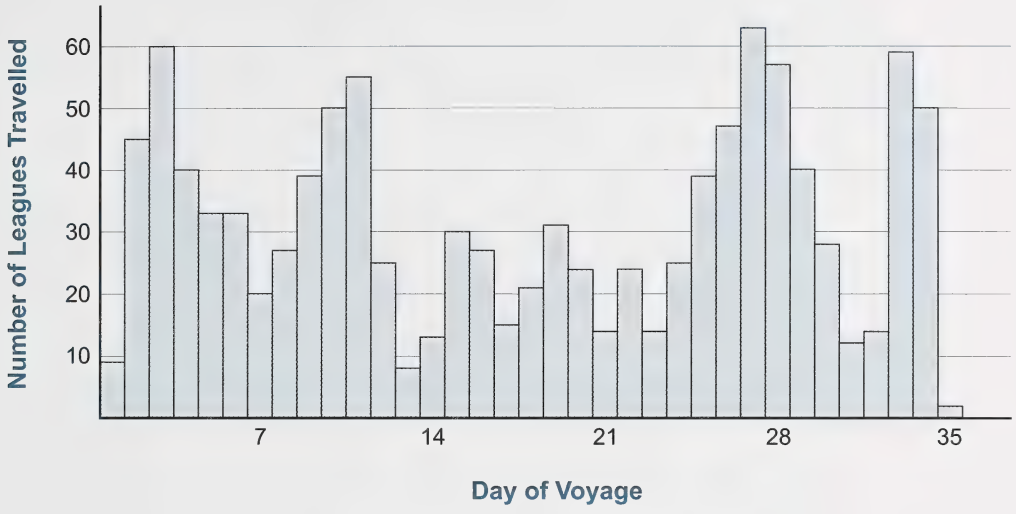


CHART 3: COLUMBUS'S WESTBOUND PASSAGE, 1492

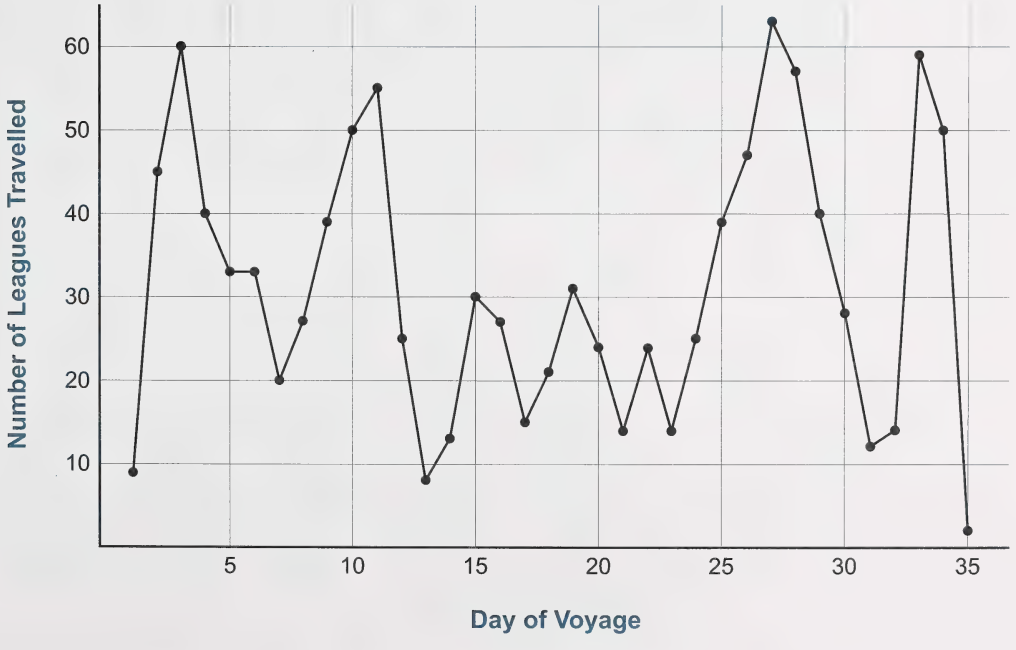


CHART 4: COLUMBUS'S WESTBOUND PASSAGE, 1492

The number of leagues travelled in one day, listed in order from the least to the greatest, are 2, 8, 9, 12, 13, 14, 14, 14, 15, 20, 21, 24, 24, 25, 25, 27, 27, 28, 30, 31, 33, 33, 39, 39, 40, 40, 45, 47, 50, 50, 55, 57, 59, 60, and 63.

CHART 5: COLUMBUS'S WESTBOUND PASSAGE, 1492

Range of Leagues Travelled in One Day	Number of Days That Distance Was Travelled	Frequency
1–10	𝍸	3
11–20	𝍸 ||	7
21–30	𝍸 ||||	9
31–40	𝍸 ||	7
41–50	||||	4
51–60	||||	4
61–70	|	1

CHART 6: COLUMBUS'S WESTBOUND PASSAGE, 1492

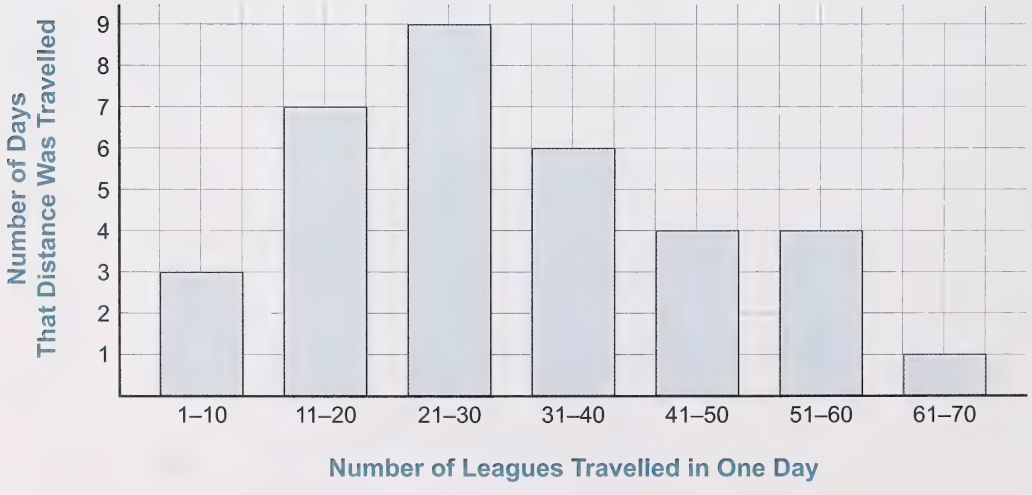


CHART 7: COLUMBUS'S WESTBOUND PASSAGE, 1492

Week of Voyage	Total Leagues Travelled
1	240
2	217
3	162
4	269
5	205

CHART 8: COLUMBUS'S WESTBOUND PASSAGE, 1492

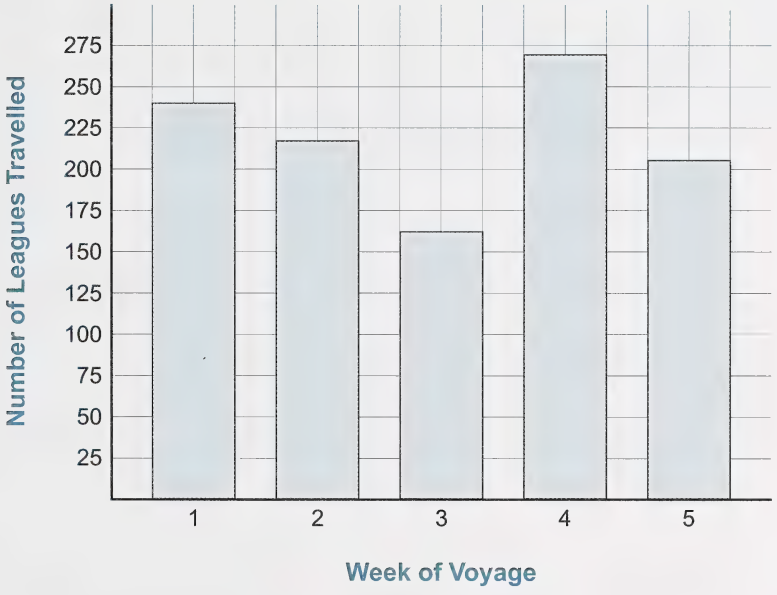
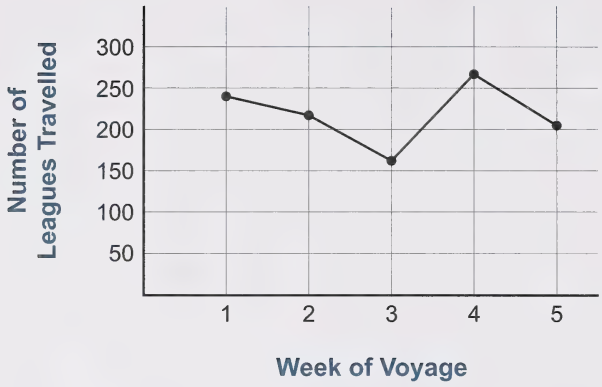


CHART 9: COLUMBUS'S WESTBOUND PASSAGE, 1492



Use Charts 1 to 9 to answer each of the following questions. After you answer each question, list all the charts that you used to find the answer.

1. What was the total distance, in leagues, of the westbound passage?

2. What was the greatest number of leagues travelled in any one day?

3. What was the least number of leagues travelled in any one day?

4. How far did Columbus sail on September 23?

5. During which week did Columbus travel the greatest total number of leagues?

6. For how many days was the distance travelled at least 30 leagues?

7. Did Columbus travel half the total distance (in leagues) in half the total time (days)?

8. What was the date that Columbus reached the half-way point of his passage?

9. Compare the total distances travelled each week. Between which two weeks was there the greatest difference?

10. At the end of his westbound passage, would it have been reasonable for Columbus to say that he had travelled about 200 leagues each week?

11. For how many days did Columbus sail more than 40 leagues each day?

12. Did Columbus's log entries form a pattern that he could have used to predict the distance he would travel on any particular day?

Check your answers on pages 70 to 72 in the Appendix.

If you have access to the Internet, you can find out more about Christopher Columbus at the following website:

http://www.mariner.org/age/columbus.html

Activity 2

Today you will explore frequency diagrams and broken-line graphs.

Kassidy and Connor made the following **tally chart** of their friends' favourite snack foods.

FAVOURITE SNACK FOODS

Snack	Tally
Fruit	𝍸 𝍸
Cereal	𝍸
Chips	𝍸 ||||
Cookies	𝍸 |||

A tally chart uses tally marks to record the number of times an event occurs.

The tally marks are grouped in sets of five for ease of counting. The fifth mark in each set is drawn diagonally across the other four marks.

A tally chart is sometimes called a **frequency table** or **frequency diagram**.

Frequency is the number of times an event occurs.

1. **a.** Of the friends, how many preferred fruit as a snack? Cereal? Chips? Cookies?

   b. How many children did Kassidy and Connor survey?

Check your answers on page 72 in the Appendix.

2. Turn to page 160 of the textbook. Use the chart on volcanoes to copy and complete each the following frequency diagrams.

   a. HEIGHT OF 19 SELECTED VOLCANOES

Range of Elevation (metres above sea level)	Tally	Frequency
0–1000		
1001–2000		
2001–3000		
3001–4000		
4001–5000		

b. LAST ERUPTION OF 19 SELECTED VOLCANOES

Range of Time	Tally	Frequency
1750–1799		
1800–1849		
1850–1899		
1900–1949		
1950–1999		

Check your answers on page 72 in the Appendix.

Data can be displayed in many different ways.

3. Turn to pages 17 to 20 in this Student Module Booklet.

a. What is the same about Charts 2 and 3? What is different?
b. What is the same about Charts 8 and 9? What is different?

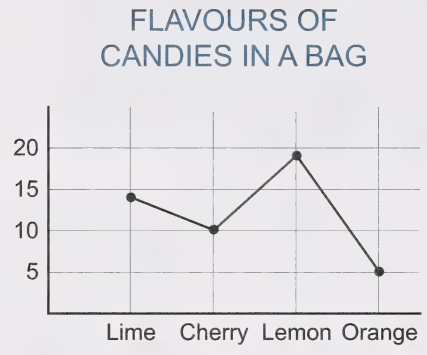
Check your answers on page 73 in the Appendix.

Charts 3 and 9 are called **broken-line graphs**.

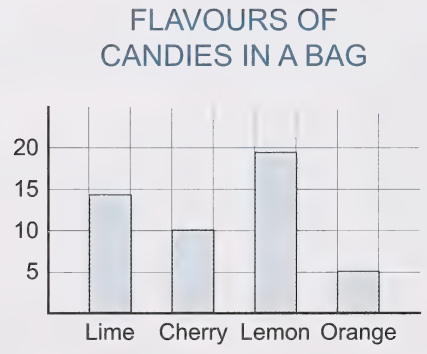
A broken-line graph uses line segments to join points and show a change or trend between the points. You cannot read between the points on a broken-line graph.

Broken-line graphs show change by using line segments to connect points.

The broken-line graph shown below is **not** appropriate for comparing the numbers of different flavours of candies in a bag because the order in which the flavours are listed does not matter.



The bar graph shown below is appropriate for comparing the numbers of different flavours of candies in a bag.

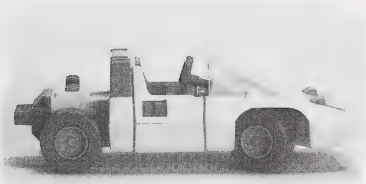


4. Turn to page 176 of the textbook and complete question 4 of Skill Bank from This Unit.

Check your answers on page 73 in the Appendix.

Sharing Time

Now it's time to show your home instructor what you have been learning.



Together with your home instructor, complete questions 1 and 2 on page 78 of your Practice and Homework Book.

Activity 3

Today you will explore line plots.

You are living in the information age. Each day you are bombarded with data (pieces of information) as you read, watch television, listen to the radio, or use the computer. Even more information can be found by your own data collection methods.

Turn to pages 150 and 151 in your textbook and answer the following questions.

1. The graph on page 150 is a **pictograph**.

   a. What does the data in the pictograph on page 150 tell you?
   b. What does each sticker stand for?

2. The graph at the top of page 151 is called a **line plot**.

   a. What does the data displayed in this line plot tell you?
   b. What does each x stand for?

3. Write a question that you can answer by reading the pictograph but not by reading the line plot.

4. Write a question that you can answer easily by reading either the line plot or the pictograph.

5. Write a question that you can answer more easily by reading the line plot than by reading the pictograph.

Check your answers on pages 73 and 74 in the Appendix.

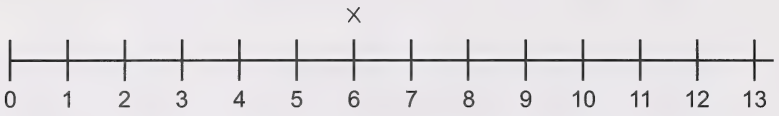
In a line plot, the possible data values are shown on a number line. Each data value is shown by placing a symbol above that value on the number line. If data values repeat, the symbols are stacked on top of each other.

Recording and displaying data plays an important role in sports. The following tables show the number of times each of the 30 National Hockey League teams played games that ended in ties up to February 9 during the 2000–2001 season.

Team	Number of Ties
Anaheim Mighty Ducks	6
Atlanta Thrashers	9
Boston Bruins	6
Buffalo Sabres	5
Calgary Flames	10
Carolina Hurricanes	6
Chicago Blackhawks	5
Colorado Avalanche	8
Columbus Blue Jackets	6
Dallas Stars	4
Detroit Red Wings	4
Edmonton Oilers	8
Florida Panthers	8
Los Angeles Kings	8
Minnesota Wild	8

Team	Number of Ties
Montreal Canadiens	5
Nashville Predators	7
New Jersey Devils	10
New York Islanders	5
New York Rangers	3
Ottawa Senators	8
Philadelphia Flyers	9
Phoenix Coyotes	12
Pittsburgh Penguins	6
St. Louis Blues	6
San Jose Sharks	10
Tampa Bay Lightning	5
Toronto Maple Leafs	7
Vancouver Canucks	5
Washington Capitals	9

6. The number of ties that Anaheim had as of February 9, 2001, has been recorded on the following line plot. Copy and complete the line plot by recording the number of ties each of the other teams had.



Number of Tied Games (up to February 9, 2001)

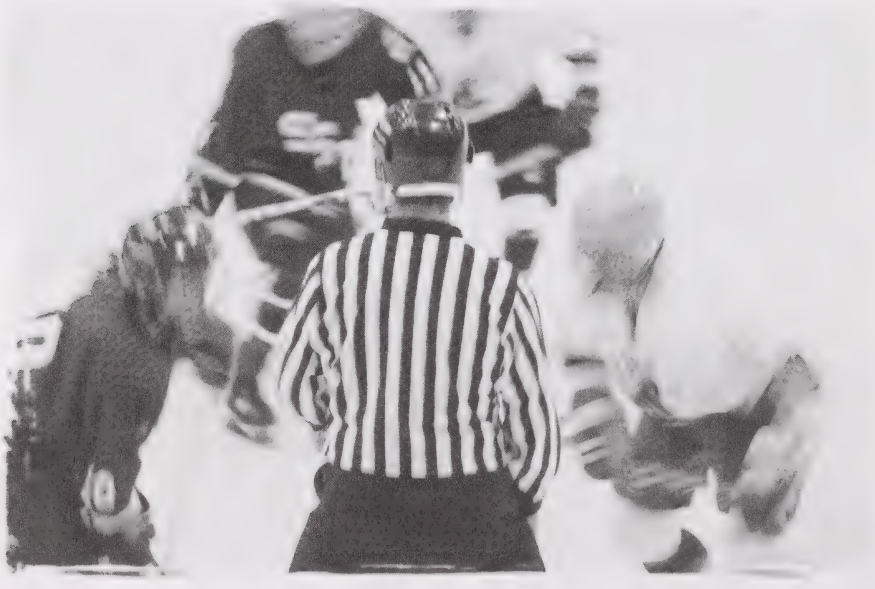
Check your answer on page 74 in the Appendix.

Use the line plot you drew for question 6 to answer the following questions.

7. **a.** What was the least number of tied games any NHL team had?
b. How many teams had that number of tied games?

8. **a.** What was the greatest number of tied games any NHL team had?
b. How many teams had that number of tied games?

9. How many teams tied more than 6 games?



10. How many teams tied more games than the Calgary Flames?

11. How many teams tied fewer games than the Flames?

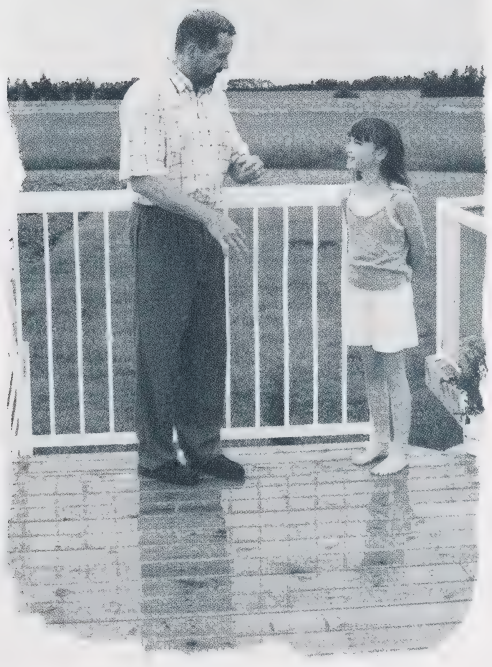
12. How many other teams had the same number of tied games as the Flames?

13. By February 9, 2001, how many games had ended in a tie? Explain.

Check your answers on page 75 in the Appendix.

Sharing Time

Now it's time to show your home instructor what you have been learning.



Together with your home instructor, complete question 1 on page 68 of your Practice and Homework Book.

Challenge Activity

The captain's log showed the difficulty experienced on a voyage to a port 50 leagues from home. Each day, after travelling 10 leagues toward the port, stormy weather at night blew the ship back 2 leagues. How long did it take to reach the port?

Check your answer on page 75 in the Appendix.

Conclusion

In this lesson you answered questions using data that was recorded and displayed in different ways. You saw that a particular kind of table or graph can be used to show different relationships in the same data. You learned how to make a line plot and a broken-line graph. You decided the best way to display data.

Do you agree that graphs are a powerful tool to display data?

Turn to Assignment Booklet 5A and complete the Lesson 1 Assignment.

Keep Assignment Booklet 5A until you have completed the entire booklet.

Lesson 2

Selecting a Sample

Have you ever gone camping in the summer and listened, in the quiet of the evening, to the cry of a loon? The call of the loon is recognized as one of the symbols of the Canadian wilderness. It is for this reason that the image of the loon appears on the Canadian dollar coin.

Recently, scientists have become worried about the concentrations of mercury in the blood of these birds in Eastern Canada. High levels of mercury affect the birds' ability to reproduce.

Since it is impossible to test all loons, how do scientists gather their data? They test enough birds from various locations so that they are confident the findings can be applied to the entire population. The group they test is called a **sample**.

In this lesson you will explore how samples are selected in a variety of situations. You will use the data collected from these samples to draw conclusions.

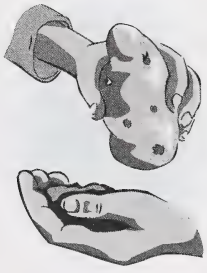
Activity 1

Today you will investigate how to choose samples from which you will obtain data.

Some voyages lasted for months, and getting a ship prepared to sail was a big task. Potatoes were a major item that kept well in the ship's hold. Shrewd merchants were anxious to sell large quantities of potatoes to sailors. Since it wasn't possible to inspect every potato, the ship's cook always filled a sack from a merchant's supply to check before purchasing enough potatoes for the whole voyage. The entire supply of a merchant's potatoes was the population for which the cook wanted information. The sack of potatoes that the cook checked was a sample of that population.

A **population** is an entire group of people or things for which information is needed. A **sample** is a small part of a population from which information is collected.

In addition to freshness, the size of the potatoes mattered because there was less waste when using larger potatoes. There are several ways to measure a potato's size. In Canada, potatoes are graded according to their diameters. For example, Canada No. 1 large potatoes vary from about 7.6 cm to 11. 4 cm in diameter. You can also measure the length, the circumference at the middle, and the mass of potatoes.

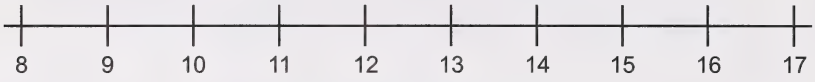


1. Use a 4.54-kg bag of Canada No. 1 table potatoes, a measuring tape, and a kitchen scale. Measure all the potatoes and complete a table like the partial sample shown, using as many rows as you need. (There are about 30 potatoes in such a bag.) **Note:** You will use the data you collect to answer questions 2 to 4. If you are unable to collect your own data, you may use the data given in the sample answer in the Appendix.

Potato Number	Length (to nearest cm)	Circumference at Middle (to nearest cm)	Mass (to nearest 10 g)

Check your answers on pages 76 and 77 in the Appendix.

2. a. Use the data in question 1 to organize the potatoes by length on a line plot similar to the one shown.

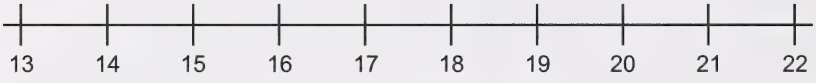


Length of Potatoes (cm)

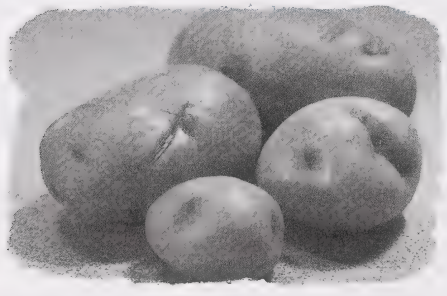
b. Use the line plot to create three different size groups for the potatoes (small, medium, and large) based on their lengths, and give the range for each size in centimetres. Explain your reasoning. Complete a table like the one shown.

Size	Range of Length (cm)	Number of Potatoes in Group
Small		
Medium		
Large		

3. a. Use the data in question 1 to organize the potatoes by circumference on a line plot similar to the one shown.



Circumference of Potatoes (cm)



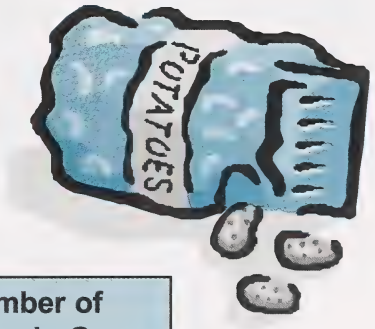
b. Use the line plot to create three different size groups for the potatoes (small, medium, and large) based on their circumferences, and give the range for each size in centimetres. Explain your reasoning. Complete a table like the one shown.

Size	Range of Circumference(cm)	Number of Potatoes in Group
Small		
Medium		
Large		

4. a. Use the data in question 1 to organize the potatoes by mass on a line plot similar to the one shown.

Mass of Potatoes (to nearest 10 g)

b. Use the line plot to create three different size groups for the potatoes (small, medium, and large) based on their masses, and give the range for each size in grams. Explain your reasoning. Complete a table like the one shown.



Size	Range of Mass (cm)	Number of Potatoes in Group
Small		
Medium		
Large		

Check your answers on pages 77 to 79 in the Appendix.

Activity 2

Today you will analyse data obtained from samples.

Jim's friend, Ann, is planning to visit Alberta next summer. Ann asked Jim what month Alberta has its warmest weather and what temperatures she might expect.

The population Jim is interested in to answer Ann's question is all centres in Alberta that keep records of their temperatures, from small towns to large cities.

The following table shows the average yearly and monthly temperatures (°C) for a sample of 15 centres in Alberta.

AVERAGE YEARLY AND MONTHLY TEMPERATURES IN ALBERTA

Centre	Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
Banff	4	−10	−8	−4	2	7	10	14	13	8	3	−4	−8
Calgary	4	−7	−5	−1	5	10	14	16	15	11	6	−2	−6
Cold Lake	3	−16	−13	−5	3	9	14	17	15	10	4	−5	−12
Edmonton	2	−11	−10	−3	4	10	13	16	14	10	4	−5	−10
Fort Chipewyan	−2	−24	−21	−14	−2	7	13	16	14	8	1	−10	−19
Fort McMurray	3	−21	−17	−8	1	9	13	16	14	8	2	−9	−18
Fort Vermilion	2	−24	−20	−13	0	8	13	15	13	7	0	−3	−21
Grande Prairie	3	−15	−14	−7	2	9	13	15	14	10	4	−6	−13
Jasper	4	−10	−7	3	3	8	12	15	14	9	4	−2	−9
Lethbridge	5	−8	−6	−2	5	10	14	17	16	10	6	0	−5
Medicine Hat	6	−10	−9	−2	7	12	17	20	19	13	7	−2	−6
Peace River	3	−15	−12	−6	3	9	14	16	14	9	4	−6	−11
Red Deer	4	−12	−11	−5	3	8	12	15	13	9	4	−3	−9
Slave Lake	0	−17	−13	−6	2	9	13	15	14	9	3	−5	−13
Wainwright	3	−15	−13	−6	3	9	14	16	15	9	4	−5	−11

1. Look at the list of centres and their locations on a map of Alberta. Do you think this is a good sample of Alberta centres from which to collect temperature data? Explain.

2. During which month should Jim suggest that Ann visit Alberta? Explain your reasoning.

3. **a.** Complete a line plot like the one shown below to show the average July temperatures for the Alberta centres sampled. (Use ✗ for the symbol.)

AVERAGE JULY TEMPERATURES (°C)
FOR ALBERTA CENTRES SAMPLED

b. Which average monthly temperature for July occurs most often in the sample?

c. Do most of the centres in the sample have the average monthly temperature you gave for question 3.b.? Explain.

d. Compare the number of centres whose average monthly temperature is greater than the answer you gave for question 3.b. with the number of centres whose average monthly temperature is less than that temperature. How do they compare?

Check your answers on pages 79 and 80 in the Appendix.

4. To answer Ann's question about what temperatures she might expect, Jim felt it was important to collect data that listed the average high temperatures and the average low temperatures in July for the 15 centres in his sample. These are shown in the following table.

Centre	July Average High (°C)	July Average Low (°C)
Banff	22	6
Calgary	22	10
Cold Lake	23	11
Edmonton	21	10
Fort Chipewyan	22	10
Fort McMurray	24	8
Fort Vermilion	23	8
Grande Prairie	22	8
Jasper	23	7
Lethbridge	25	10
Medicine Hat	28	12
Peace River	23	9
Red Deer	22	8
Slave Lake	22	9
Wainwright	23	10

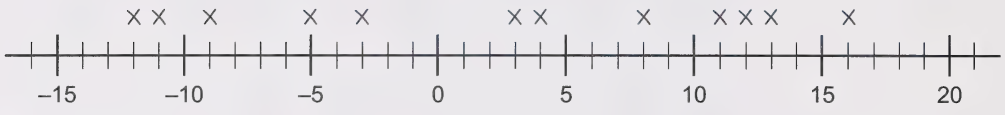
a. Using the same line plot that you drew in question 3, plot the average high and low temperatures. Use H for the high symbol and L for the low symbol.

b. If you were Jim, what would you tell Ann about weather in Alberta and what she might expect in July?

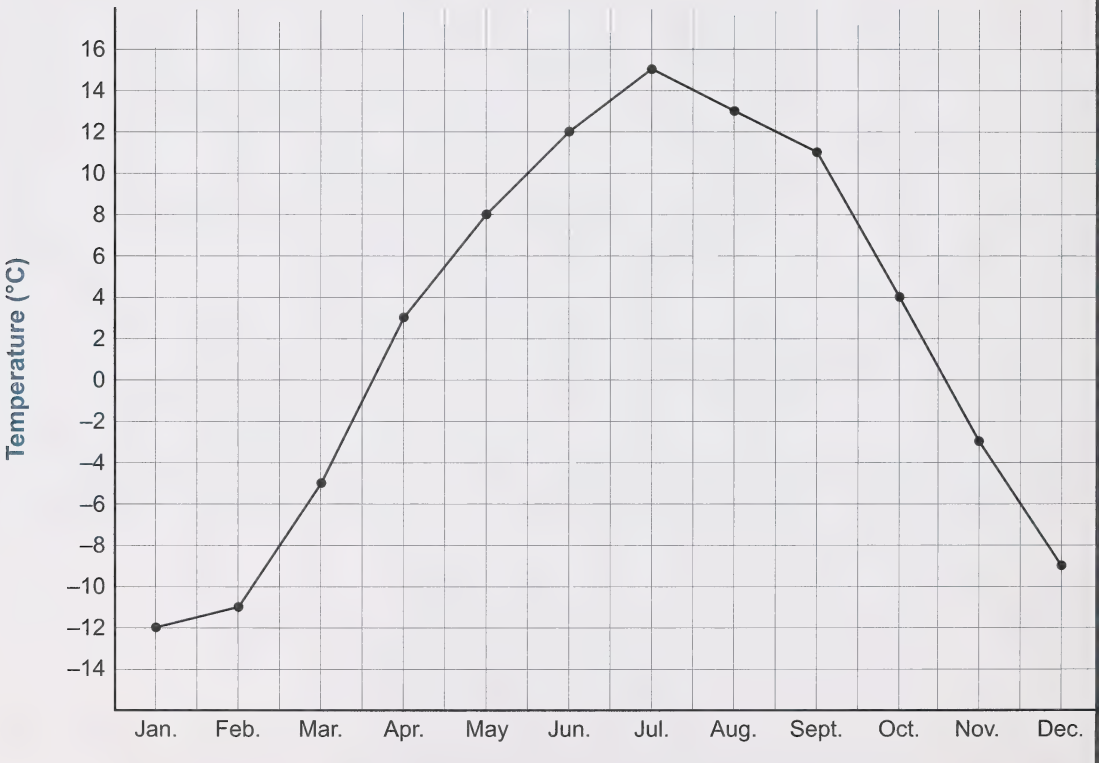
Check your answers on page 80 in the Appendix.

Ann also asked Jim what the temperatures were like throughout the year in Red Deer, where he lives. Jim made a line plot and a broken-line graph of the average monthly temperatures for Red Deer. These are shown below.

AVERAGE MONTHLY TEMPERATURES (°C)
FOR RED DEER



AVERAGE MONTHLY TEMPERATURES (°C)
FOR RED DEER



5. a. What does the line plot show you?

b. How useful is this information in explaining what the temperatures are like throughout the year?

6. **a.** What does the broken-line graph show you?

   b. How useful is this information in explaining what the temperatures are like throughout the year?

Check your answers on page 81 in the Appendix.

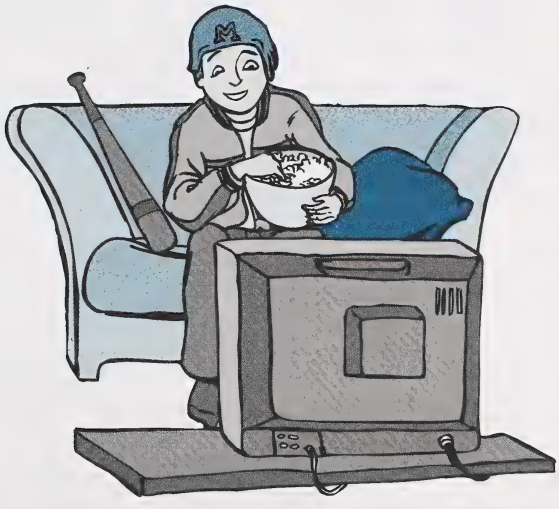
7. **a.** Complete a line plot to show the average yearly temperatures for the 15 Alberta centres in the sample. (See the first column in the chart of Alberta centres used for question 1.)

   b. Would this line plot be a good graph to put in a travel brochure for Alberta? Explain.

Check your answers on page 81 in the Appendix.

Sharing Time

Now it's time to show your home instructor what you have been learning.



Suppose you wanted to determine what television show was most popular among Grade 5 students in your community. Explain to your home instructor how you might select a sample that fairly represents the views of the population.

Activity 3

Today you will examine how a sample can be chosen to represent a population.

When Kassidy looked at the change she got at the store, she became excited. "Wow!" she said, "This is the oldest penny I've ever seen! It has a picture of King George VI on it. The date on it is 1952, so it's about 50 years old." That made her wonder how long Canadian coins stay in circulation.

1. What is the population Kassidy would want to collect data from to answer her question?

2. If Kassidy took all the coins from her change purse, do you think they would be a good sample of the population to use? Explain.

3. If Kassidy took all the coins from her piggy bank, do you think they would be a good sample of the population to use? Explain.

Check your answers on page 81 in the Appendix.

Kassidy contacted the Royal Canadian Mint and asked the following questions:

- How many coins are now in circulation?
- How long do coins stay in circulation?

She was amazed to find that there are billions of coins now in circulation. Millions of new pennies are produced every year. In fact, in 1989 alone, more than one billion new pennies were put into circulation. Kassidy also learned that the average length of time a coin remains in circulation is about 30 years. Banks return stained or damaged coins to the Mint, where they are destroyed. Some coins are taken out of circulation by private collectors.

Kassidy realized that no matter how many coins she used for a sample, it would be much too small to give her a good picture of what the population was like. She was still curious, however, to see how old the coins were that she and her family had. She was especially interested to see how many of their coins have been in circulation for more than 30 years.

Maple leaf pennies, beaver nickels, schooner dimes, and caribou quarters have been in circulation since 1937. Since loonies and toonies have not yet been in circulation for 30 years, she decided not to include them in her investigation.

Kassidy asked each person in her family to show her the pennies, nickels, dimes, and quarters they had in their purse, wallet, or pocket. She lined up each kind of coin in rank order, from oldest to newest, and found how long each one had been in circulation.

This is the data that Kassidy gathered from her investigation.

Coins	Number of Years in Circulation
Pennies	28, 20, 16, 13, 13, 11, 9, 8, 6, 4, 4, 3, 2, 2, 2, 1, 1, 1, 1, 1, 1, 1, 1
Nickels	37, 29, 25, 23, 19, 16, 14, 14, 12, 4, 3, 2, 1, 1, 1, 1, 1
Dimes	32, 28, 20, 20, 16, 15, 9, 8, 8, 8, 5, 3, 3, 1, 1, 1, 1, 1, 1, 1
Quarters	24, 24, 24, 23, 22, 22, 22, 22, 21, 20, 19, 17, 17, 16, 16, 15, 15, 15, 12, 7, 7, 6, 6, 1, 1, 1, 1, 1, 1

4. How do you think Kassidy found the number of years a coin had been in circulation?

5. She decided to display her data on a line plot. She started the number line at zero. Which coins would she represent by zero years of circulation?

6. Use Kassidy's data to complete a line plot showing the number of years in circulation for a sample of pennies, nickels, dimes, and quarters.

7. Use Kassidy's data to complete a table like the following sample.

	Current Year	1 to 10 Years	11 to 20 Years	21 to 30 Years	31 to 40 Years	Older Than 40 Years
Number of Coins						

8. Do you see any trends in the line plot you made in question 6 and the table you made in question 7?

9. What was the oldest coin in Kassidy's collection? How many years has it been in circulation?

10. Collect your own sample of coins from your family. Complete a line plot to show how long each of the coins in your sample has been in circulation.

11. Describe your sample and tell if any of the coins surprised you.

Check your answers on pages 82 and 83 in the Appendix.

Challenge Activity

Frank's favourite snack is Snackies, a mixture of spicy peanuts, popcorn, and raisins. Frank likes the spicy peanuts best, so he is always pleased when a box has lots of peanuts. He collected data from a sample of boxes of Snackies. He counted the number of peanuts in each box.

- The greatest number of spicy peanuts in each box was 34. The least number was 21.
- There was only one box with 21, 23, or 34 peanuts.
- None of the boxes had 22, 24, or 25 peanuts.
- Three boxes each had 28 peanuts.
- The most frequent number of peanuts was 30, found in 5 boxes.
- Four boxes had one less than the most frequent number of peanuts, and four boxes had one more than the most frequent number of peanuts.
- Two boxes had a multiple of 13 peanuts.
- Two boxes had one less peanut than the greatest number of peanuts.

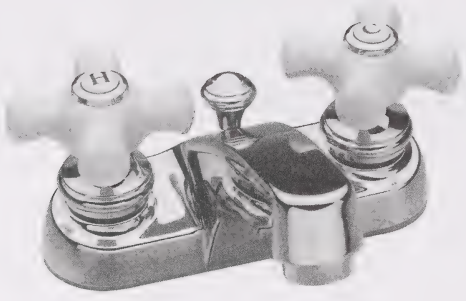
1. Make and label a line plot to show the results of Frank's investigation.

2. Make up three questions that can be answered using your line plot, and then answer them.

Check your answers on page 83 in the Appendix.

Conclusion

In this lesson you explored the difference between a sample and a population. You selected samples and collected data from samples to draw conclusions about the populations they represent.



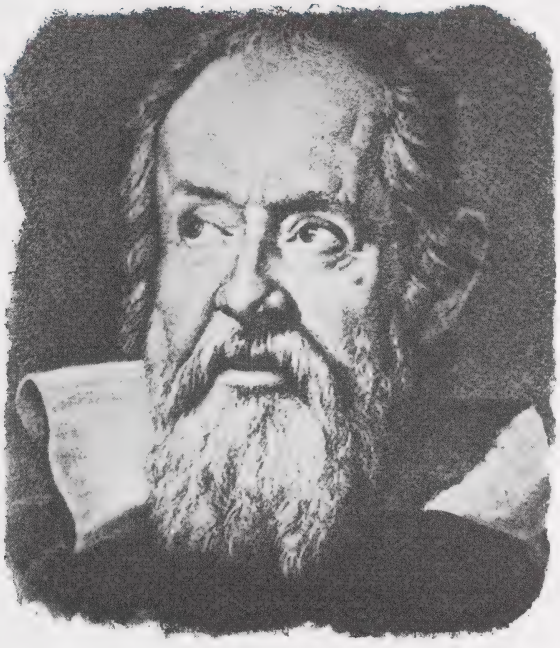
Sampling techniques have a number of applications you may not have considered. Canada is fortunate to have $\frac{1}{5}$ of the planet's fresh water supply. But how do Canadians know that when they turn on the tap at home, the water is safe to drink? The employees who are responsible for water treament in communities across the country take regular water samples. These water samples are tested for the presence of contaminants that may make the water unfit to drink. It is impossible to test all the water that is treated, so the safety of the entire water supply must be based on the quality of the samples.

Turn to Assignment Booklet 5A and complete the Lesson 2 Assignment.

When you are done, send Assignment Booklet 5A to your distance learning teacher to be marked.

Lesson 3

Collecting Data from Experiments



Are you considering a career in science? Scientists have inquisitive minds, are keen observers, and keep careful records when they conduct experiments.

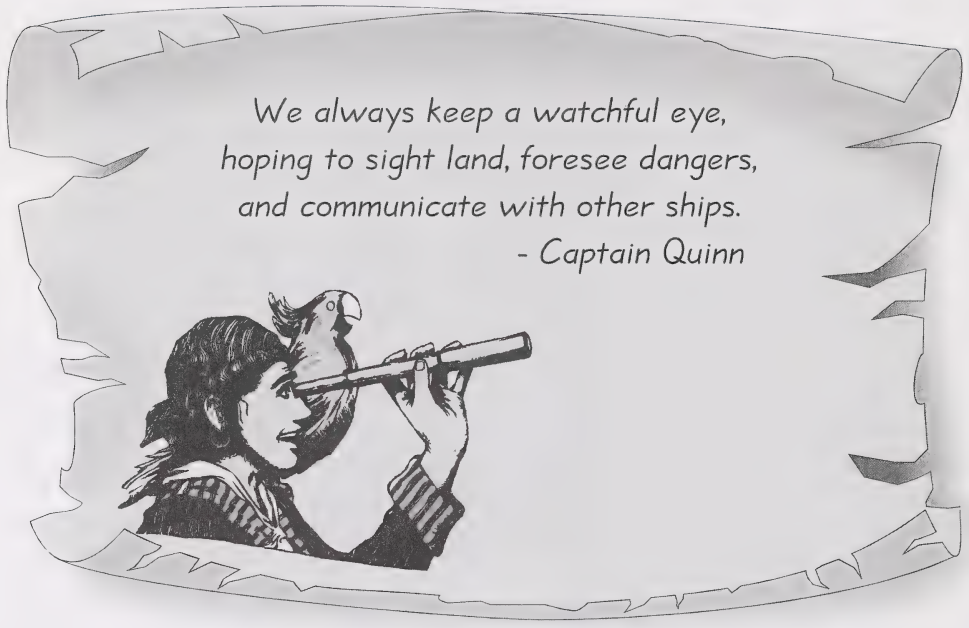
The Italian physicist and astronomer Galileo (1564–1642) is considered the father of modern experimental science. As a young man, Galileo observed that a pendulum takes the same time to swing back and forth in an arc regardless of whether the arc is large or small.

This principle was used to make accurate time pieces. Captain Quinn relied on accurate time pieces on his ship to help him keep track of where he was in the high seas.

In this lesson you will conduct experiments, collect data, and analyse the data to answer questions and solve problems.

Activity 1

Today you will conduct an experiment, record data from this experiment, and answer questions based on your observations.



Telescopes were a necessity at sea. Important uses included sighting land, looking for dangerous rocks, spotting enemy ships, watching for signal flags, and looking for wild game. The diameters and lengths of early telescopes varied. Longer telescopes allowed sailors to sight things at greater distances.

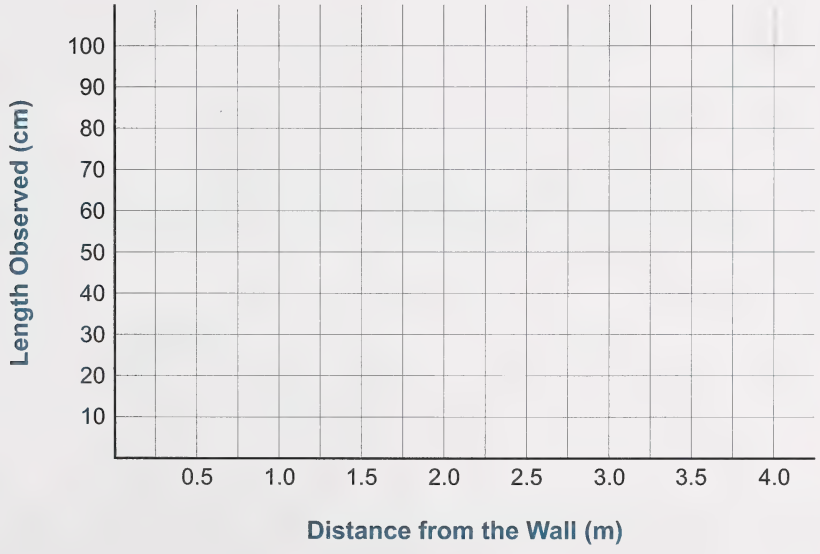
Did you know that Galileo built large and powerful telescopes and improved their design?

Turn to pages 168 and 169 of your textbook.

1. a. Conduct the experiment described on page 168. Record your results at the following distances from the wall: 0.5 m, 1 m, 1.5 m, 2.0 m, 2.5 m, and 3.0 m. Your table should be similar to the one shown.

Distance from Wall (m)	Length Observed (cm)
0.5	
1	
1.5	
2.0	
2.5	
3.0	

b. Use graph paper to make a broken-line graph to display your data. Your graph should be set up like the one shown.



c. Explain what happened as you moved farther away from the wall.

d. Why is it appropriate to use a broken-line graph for this data?

2. Use graph paper to make a broken-line graph for each of the three sets of data shown on page 169 of your textbook.

3. What is an appropriate title for each of the three broken-line graphs you made?

Use the graphs you made in question 2 to answer questions 4 to 8.

4. **a.** Which of the broken-line graphs is most like the broken-line graph you made with your data in question 1.b.?

   b. Which tube shown on page 169 was most likely used to get that set of data? Explain.

5. If you used the tube for Set 1 and stood 1.75 m from the wall, what length of metre-stick might you see? Explain.

6. If you used the tube for Set 2, how far from the wall do you think you would have to stand to see the entire metre-stick? Explain.

7. If you used the tube for Set 3, how much of the metre-stick do you think you would see if you stood 4 m from the wall? Explain.

8. Match each of the tubes (Tubes A, B, and C) on page 169 with its set of data (Set 1, Set 2, and Set 3). Explain.

Check your answers on pages 84 to 87 in the Appendix.

Activity 2

Today you have another opportunity to conduct experiments, record data, and display and analyse the results.

Have you ever watched a light rain falling on a flat surface, such as a patio table? Little by little, the surface of the table becomes covered with water, until it finally overflows.

Turn to page 152 of your textbook and read the experiment described in Analyzing Data.

1. a. Predict how many drops of water will fit on a penny before it overflows.

b. Conduct the experiment. Place a penny on a paper towel as shown in the picture on page 152. Use a glass of water and an eyedropper. Drop one drop of water at a time on the top surface of the penny. Count the number of drops the penny holds before the water overflows. Dry the penny and repeat the experiment for a total of 10 trials. Record your results in a table like the one shown.

Penny Trial Number	1	2	3	4	5	6	7	8	9	10
Number of Drops										

c. Display your results on a line plot.

2. **a.** Predict how many drops of water will fit on a nickel before it overflows.

   b. Repeat the experiment using a nickel, and record your results in a table like the one you made for question 1.

   c. Display your results on a line plot.

3. **a.** Predict how many drops of water will fall on a quarter before it overflows.

   b. Repeat the experiment using a quarter, and record your results in a table like the ones you used for questions 1 and 2.

   c. Display your results on a line plot.

4. **a.** Predict how many drops of water will fit on a one-dollar coin (loonie) before it overflows.

   b. Repeat the experiment using a loonie, and record your results in a table.

   c. Display your results on a line plot.

5. **a.** Predict how many drops of water will fit on a two-dollar coin (toonie) before it overflows.

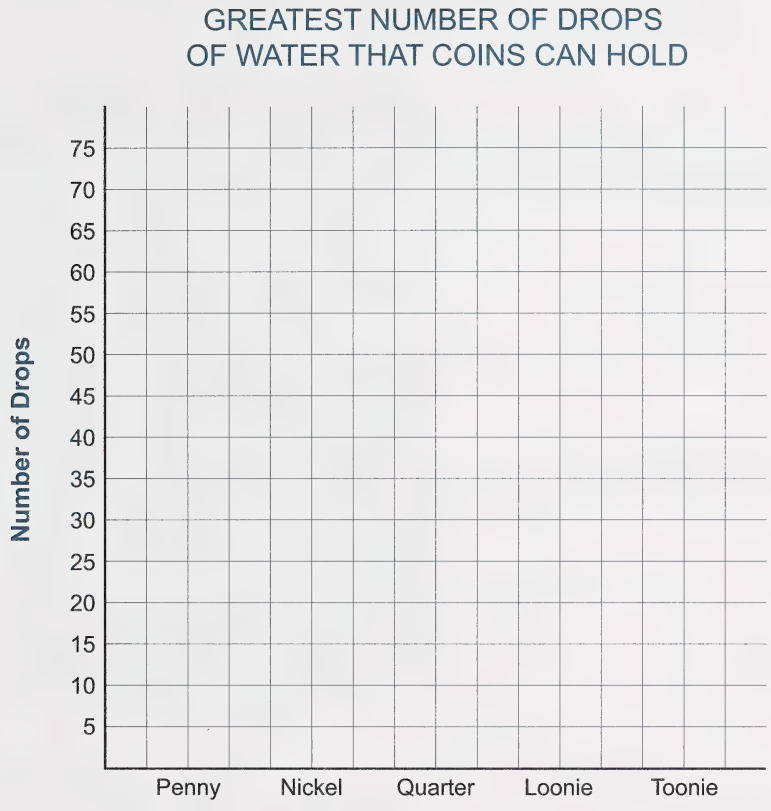
   b. Repeat the experiment using a toonie, and record your results in a table.

   c. Display your results on a line plot.

Check your answers on pages 87 to 89 in the Appendix.

6. To make a bar graph that compares the number of drops of water that the different coins can hold before overflowing, why might you compare the greatest number of drops instead of the most frequent number of drops?

7. Make a bar graph to compare the greatest number of drops of water that each kind of coin can hold before it overflows. Your graph should look similar to the following sample.



8. Stack a penny, a nickel, a quarter, a loonie, and a toonie in order of size, with the largest coin on the bottom. Do you see a relationship between how the coins stack on top of each other and the bars in the graph you made in question 7?

9. **a.** Describe how the water looked on the coins just before it overflowed.

   b. Were you surprised at how much water the coins could hold?

Check your answers on pages 89 and 90 in the Appendix.

Activity 3

Today you will conduct an experiment, collect data, display the data on graphs, and use your graphs to show conclusions.

For this activity, you will be working on a carpeted floor. You will need two metre-sticks marked in centimetres, a paper towel tube, ten base ten flats, a large marble, and a small marble. Set up the experiment by looking at the picture above and following these directions:

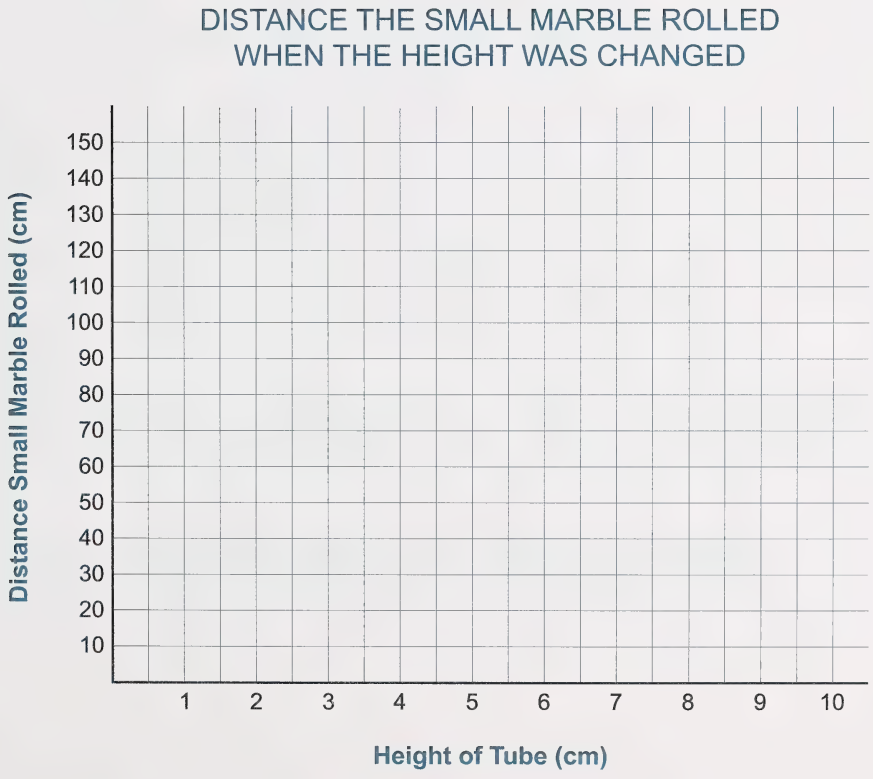
- Make a track with two metre-sticks. Place them about 6 cm apart so that their zero ends are even with each other.
- Set one end of the paper towel tube between the metre-sticks so that it opens between the zero ends of the metre-sticks.
- Raise the other end of the tube by placing it on the edge of one base ten flat.

1. Hold the small marble at the top of the tube and release it. (Do not push it.) Find how far (in centimetres) the marble rolls down the track by reading the metre-stick and record the distance. Repeat the experiment for a total of ten trials. For each trial, raise the end of the tube 1 cm by adding another base ten flat under its top end. Your data table should look similar to the sample shown.

Number of Flats Used to Raise Tube	1	2	3	4	5	6	7	8	9	10
Distance Small Marble Rolls (cm)										

2. Repeat the ten trials with the large marble. Record your results in a table like the one you made in question 1.

3. Make a broken-line graph with the data you collected for the small marble. Your graph should look similar to the sample shown.



4. Make a broken-line graph with the data you collected for the large marble.

5. Describe your graphs. What patterns or trends do they show?

Check your answers on pages 90 to 92 in the Appendix.

Sharing Time

Now it's time to show your home instructor what you have been learning.

Demonstrate (by rolling marbles and measuring distances) what you have concluded from the data you collected and graphed from your experiment. Discuss whether these results are reasonable.

Challenge Activity

A container of 40 gumballs had a total mass of 135 g. After 10 gumballs were taken out, the container and remaining gumballs had a mass of 105 g. After another 3 gumballs were taken out, the container and remaining gumballs had a mass of 96 g. After another 15 gumballs were taken out, the container and remaining gumballs had a mass of 51 g.

Make a broken-line graph and use it to find the mass of the container.

Check your answer on page 92 in the Appendix.

Conclusion

In this lesson you conducted experiments to answer questions. You collected data, displayed it, and then analysed it to make conclusions.

Scientists use the techniques you practised in this lesson in their daily work. Did you know that Galileo rolled balls down inclines to demonstrate the principle that objects of different masses fall at the same rate? For example, if you dropped two stones of different masses at the same time from a bridge, they would strike the water at the same time. Before Galileo, most people thought heavier objects fall faster than light objects.

Turn to Assignment Booklet 5B and complete the Lesson 3 Assignment.

Keep Assignment Booklet 5B until you have completed the entire booklet.

Module Summary

In this module you reviewed and extended the ways you collect, record, organize, display, and analyse data. You learned to make line plots and broken-line graphs, and you saw how they are used to show different relationships among data. You learned the difference between a population and a sample and how a sample can be useful when you cannot collect all the data you want to examine. You collected data by conducting experiments to answer questions. You saw that it is important to organize and display your data in ways that best solve your problems.

There are many occupations that depend on the collection, organization, display, and interpretation of data. Statisticians from Statistics Canada gather information about all Canadians by conducting a census every five years. Governments rely on this information to make plans for the future.

Research companies sample opinions with questionnaires and telephone surveys. These companies gather this information so that political parties can gauge their support or companies can make decisions about products to offer to their customers. Have you ever been asked to participate in a survey?

Turn to Assignment Booklet 5B and complete the Numbers in the News project.

When you are done, send Assignment Booklet 5B to your distance learning teacher to be marked.

Keystrokes

Take out your calculator and complete the following exercises. They will help you review some of the ideas you have learned in Module 5.

Funky Feature: Power Overload!

In Module 4 you saw how you can multiply a number by itself. Suppose you keep multiplying over and over again by that same number. Eventually, your calculator display will overload and you will get an error signal (E). For example, try multiplying 2 over and over again.

Keystrokes	ON/C	2	×	=	=	=	=	=	=	=	=	=	=
Display	0	2	2	4	8	16	32	64	128	256	512	1024	2048

1. a. So far, you have pressed the = key ten times. Guess how many more times you can press the = key before the display overloads. Then do it.

b. Guess how many times you can multiply 3 by itself before your calculator display overloads. Do it.

Now try multiplying 4 by itself, 5 by itself, and so on all the way to 12. Record the results of your investigation in a table like the one shown.

Number Multiplied	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Number of Times = Key Is Pressed										

c. What are you starting to notice about the number of times you can press the = key? As you are pressing the = key, try to predict when the next press will overload the display. Keep going—try the numbers 13 through 30.

d. Predict the least numbers for which you can press the = key only three times, only two times, only once, and no times.

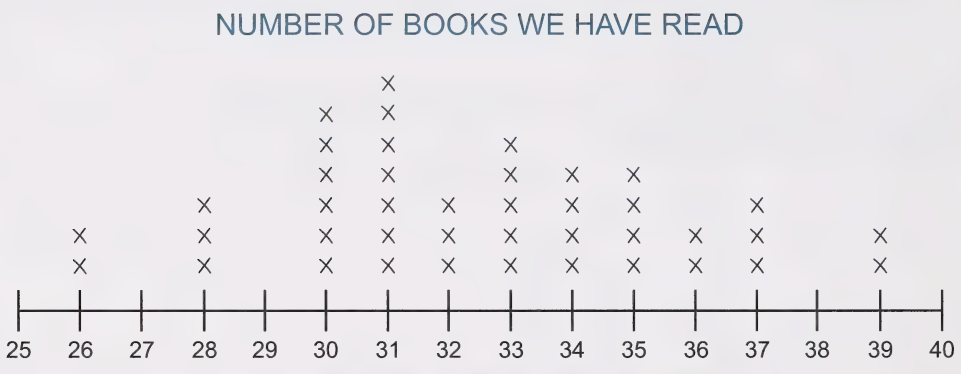
You have just experienced the power of powers!

Check your answers on pages 93 and 94 in the Appendix.

Funky Feature: Marvelous Memory

This feature lets you multiply and add at the same time!

To show how many books members have read in the past year, Bob's book club made the following line plot.



Bob wanted to find the total number of books read by the members. He knew that he first had to multiply each number of books read by the number of people who read that many books and then had to add all his answers. To do this, he used the memory function of his calculator.

As you do your multiplying, press the M+ (Memory Plus) key instead of the = key. The answer to the multiplication is shown on the display, and it is also added to the number in the memory. When you have finished all your multiplying, press the MRC (Memory Recall) key. This will display the total number of books read.

Keystrokes	ON/C	2	×	26	M+	3	×	28	M+	6	×	30	M+
Display	0	2	2	26	52	3	3	28	84	6	6	30	180

7	×	31	M+	3	×	32	M+	5	×	33	M+	4	×	34	M+
7	7	31	217	3	3	32	96	5	5	33	165	4	4	34	136

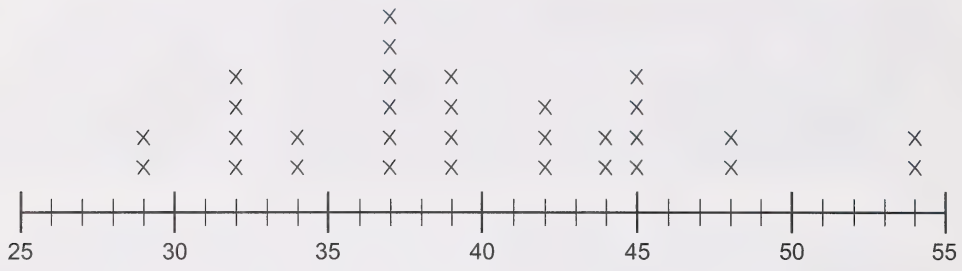
4	×	35	M+	2	×	36	M+	3	×	37	M+	2	×	39	M+	MRC
4	4	35	140	2	2	36	72	3	3	37	111	2	2	39	78	1331

The members of Bob's book club read a total of 1331 books in the past year.

2. a. Find the total number of boxes of cookies sold to raise funds.

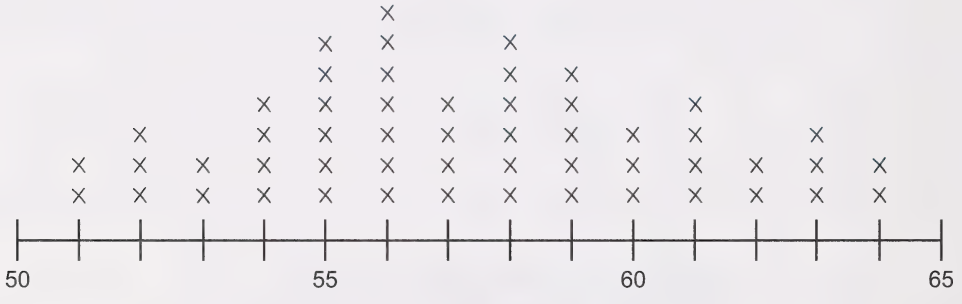
b. Find the total number of people who swam at the pool on different days in January.

HOW MANY PEOPLE SWAM AT THE POOL
ON DIFFERENT DAYS IN JANUARY



c. Find the total number of strawberries in the baskets at the farmers' market.

HOW MANY STRAWBERRIES WERE IN
THE BASKETS AT THE FARMERS' MARKET



Check your answers on pages 94 and 95 in the Appendix.

Review

This review will help you apply what you learned in Module 5 and prepare for the final test. Discuss with your home instructor when you should begin the Review and how much of the Review you should complete.

1. Turn to pages 158 to 159 in your textbook. Look at the table of temperatures on page 159.

   a. Which city listed has the hottest mean June high temperature?

   b. Which cities listed have a 10°C difference between their mean June high and low temperatures?

   c. Which city listed has the least difference between its mean June high temperature and its mean June low temperature?

   d. What is the difference between Calgary's mean June high temperature and its mean June low temperature?

2. Turn to page 146 of your textbook. Look at the bar graph in the upper left corner.

   a. In which year were the annual sales the greatest, and what was the amount?

   b. In which year were the annual sales the least, and what was the amount?

   c. Find the difference between the sales for the years you gave for questions 2.a. and 2.b.

   d. For which years were the annual sales greater than the previous year?

If you need help with questions 1 and 2, look back at Lesson 1, where you learned about interpreting data displays. If you feel you need more practice, do questions 3 and 4.

3. Turn to page 160 in your textbook. Look at the table of volcano data.

   a. Which volcano is the greatest number of metres above sea level?

   b. Which volcano is the least number of metres above sea level?

   c. Which volcano had the most recent major eruption?

   d. For which volcano have the most years passed since its last major eruption?

4. Turn to page 147 of your textbook. Look at the bar graph in the upper right corner.

   a. Which of the teams shown went the most years without winning in its division?

   b. Which of the teams shown went the least years without winning in its division?

   c. How many more years has Chicago gone without winning than Toronto?

   d. Which team has gone more than twice as many years without winning than some teams?

Check your answers on pages 95 and 96 in the Appendix.

5. Turn to Skill Bank from This Unit on page 176 of your textbook. Do question 1.

6. Turn to page 223 of your textbook. Do question 1 of Skill Bank Looking Back.

If you need help with questions 5 and 6, look back at Lesson 1, where you learned about making line plots. If you feel you need more practice, do questions 7 and 8.

7. Turn to page 197 of your textbook. Do question 6 of Skill Bank Looking Back.

8. Turn to Practise Your Skills on page 157 of your textbook. Look at the data for ages of parents of Grade 5 students. Label and complete a line plot that shows the ages of the parents.

Check your answers on pages 96 and 97 in the Appendix.

9. Kylee keeps track of the hours she practises her dancing each day. Her hours for one week were as follows: Sunday, 4 hours; Monday, 2 hours; Tuesday, 1.5 hours; Wednesday, 2 hours; Thursday, 2.5 hours; Friday, 3 hours; and Saturday, 4.5 hours.

   a. Use graph paper to label and complete a broken-line graph that shows how Kylee's practice time changed from day to day through the week.

   b. What does the graph show you about Kylee's practising?

If you need help with question 9, look back at Lesson 1, where you learned about making broken-line graphs. If you feel you need more practice, do question 10.

10. Turn to page 197 of your textbook. Do question 5 of Skill Bank Looking Back.

Check your answers on page 98 in the Appendix.

11. Victor wanted to buy a video game, but he didn't have enough money. He used some video games advertised in the newspaper as a sample to help him figure out how much money he might have to save. The prices he found were as follows: $39.90, $29.99, $39.99, $44.99, $35.00, $36.99, $49.97, $39.90, $56.99, $33.99, $49.90, $42.49, $42.49, $54.00, $44.90, $44.99, $46.90, $48.90, $49.90, $49.97, $49.99, $42.49, $54.99, $39.99, and $42.49. To compare the prices, he first rounded each one to the nearest dollar.

a. Label and complete a line plot that shows the rounded prices.

b. What is the population for which Victor wanted to collect data?

c. Do you think Victor used an appropriate sample? Explain.

d. If Victor wanted to know within about ten dollars how much he should save, how would his line plot help him decide this?

If you need help with question 11, look back at Lesson 2, where you learned about using samples to answer questions. If you feel you need more practice, do question 12.

12. Turn to page 223 of your textbook. Look at the data in question 2 of Skill Bank Looking Back.

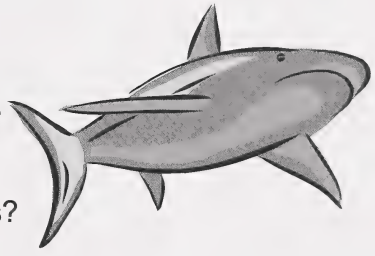
a. If you wanted to know how tall ten-year-olds are, do you think this is a good sample?

b. Make a line plot to show the heights. Be sure to clearly label it.

c. What is the most frequent height in the sample?

Check your answers on page 99 in the Appendix.

13. Turn to page 157 in your textbook. Look at the data in question 2 of On Your Own.



a. Make two line plots: one for the sharks' results and one for the dolphins' results.

b. How do the line plots help you decide who is faster, the sharks or the dolphins?

If you need help with question 13, look back at Lesson 3, where you learned about collecting data from experiments to answer questions. If you feel you need more practice, do question 14.

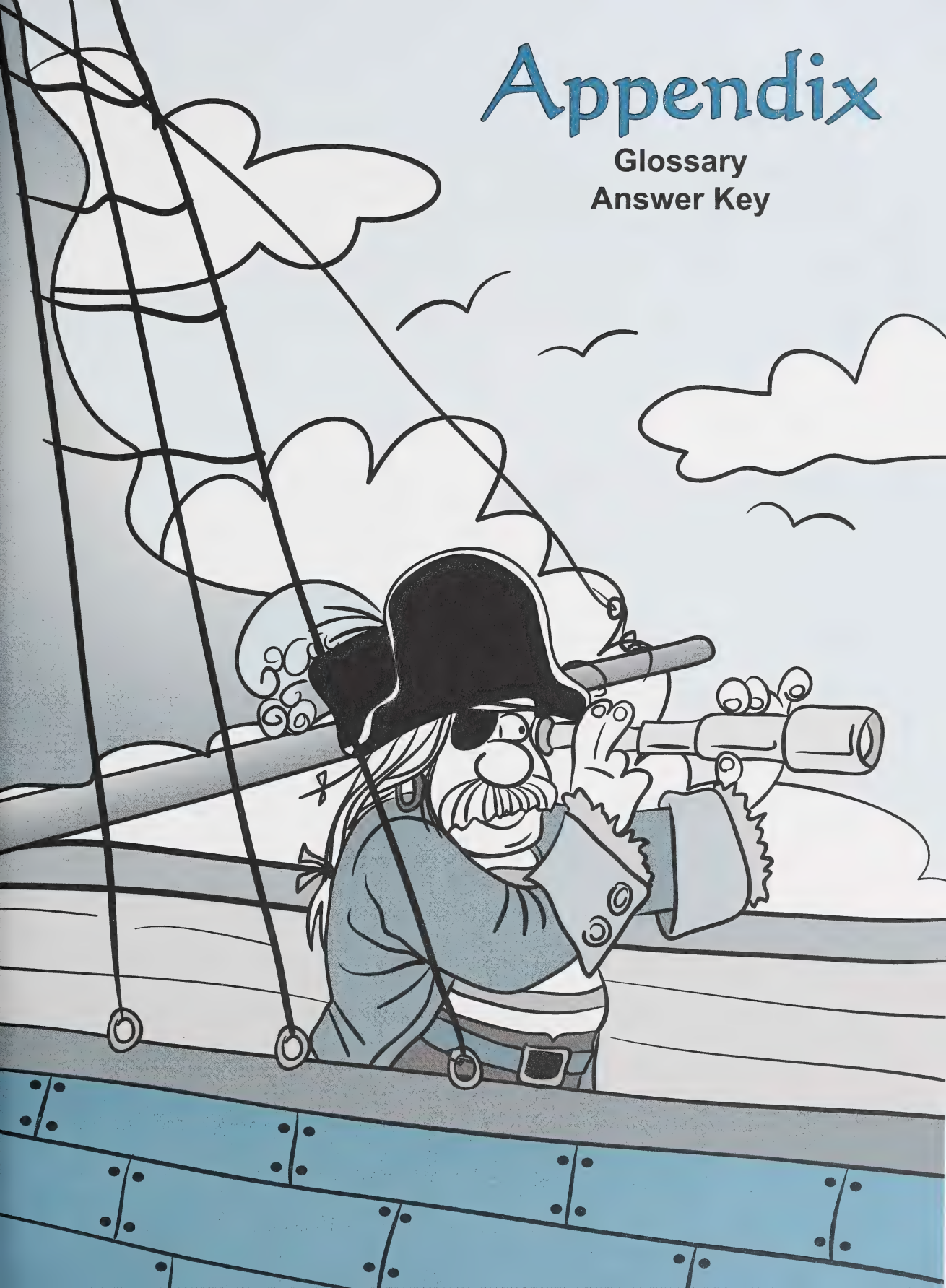
14. Turn to page 155 of your textbook to Estimating Time. Look at the survey results students collected for the time it takes them to get to school.

a. Make a line plot to show the times. Be sure to clearly label it.

b. What is the most frequent time taken to get to school?

c. What is the range of times (difference between the greatest time and the least time)?

Check your answers on page 100 in the Appendix.



Appendix

Glossary
Answer Key

Glossary

broken-line graph: a graph that consists of connected line segments and is used to show how a quantity changes

data: information gathered for analysis

frequency: the number of times an event occurs

frequency diagram: a chart used to record the data collected

line plot: a graph consisting of a number line and symbols stacked up over values on the number line to represent how often these values occur

pictograph: a graph using pictures or symbols to represent quantity

population: an entire group of people or things for which information is needed

sample: part of a population from which information is gathered

Answer Key

Lesson 1: Organizing and Displaying Data

Activity 1

1. The total distance of the westbound passage was 1093 leagues.

   Chart 7 is most appropriate, but Charts 1 and 4 can also be used.

2. The greatest number of leagues travelled in any one day was 63.

   Charts 1 and 4 are most appropriate.

3. The least number of leagues travelled in any one day was 2.

   Charts 1 and 4 are most appropriate.

4. Columbus sailed 27 leagues on September 23.

   Only Chart 1 can be used because no other table refers to specific dates.

5. Columbus travelled the greatest total number of leagues during the fourth week.

   Charts 7, 8, and 9 are most appropriate.

6. For 17 days, the distance travelled was at least 30 leagues.

   Charts 1, 2, 3, and 4 are most appropriate.

7. Yes, Columbus travelled about half the total distance in half the total time. Half of the total distance is 1093 leagues $\div 2 = 546.5$ leagues. The trip was 35 days, so the middle day was day 18. The total distance travelled by the end of day 17 (September 24) was 529 leagues, and the total distance travelled by the end of the day 18 (September 25) was 550 leagues, which is more than half way.

   Chart 1 is most appropriate, but Charts 2 and 3 can also be used.

8. On September 25, Columbus had travelled half the distance.

   Only Chart 1 can be used.

9. The greatest difference was between the third and fourth weeks.

   Charts 8 and 9 are most appropriate, but Charts 1, 2, 3, and 7 can also be used.

10. It would have been reasonable for Columbus to say that he had travelled about 200 leagues each week because using estimation, $1093 \div 5$ is about 200 leagues per week.

    Charts 7, 8, and 9 are most appropriate, but Charts 1, 2, and 3 can also be used.

11. For nine days, the distance travelled was greater than 40 leagues.

    Charts 5 and 6 are most appropriate, but Charts 1, 2, 3, and 4 can also be used.

12. Columbus's daily log was not useful for predicting the distance he would travel on any particular day because the distance from day to day varied greatly.

Charts 2 and 3 are most appropriate, but Chart 1 can also be used.

Activity 2

1. a. Of the friends, 10 preferred fruit, 5 preferred cereal, 9 preferred chips, and 8 preferred cookies.

b. Kassidy and Connor surveyed $10 + 5 + 9 + 8 = 32$ children.

2. a. HEIGHT OF 19 SELECTED VOLCANOES

Range of Elevation (metres above sea level)	Tally	Frequency
0–1000	||	2
1001–2000	𝍸 ||	7
2001–3000	|||	3
3001–4000	||||	4
4001–5000	|||	3

b. LAST ERUPTION OF 19 SELECTED VOLCANOES

Range of Time	Tally	Frequency
1750–1799	|	1
1800–1849	||||	4
1850–1899	𝍸	5
1900–1949	𝍸	5
1950–1999	||||	4

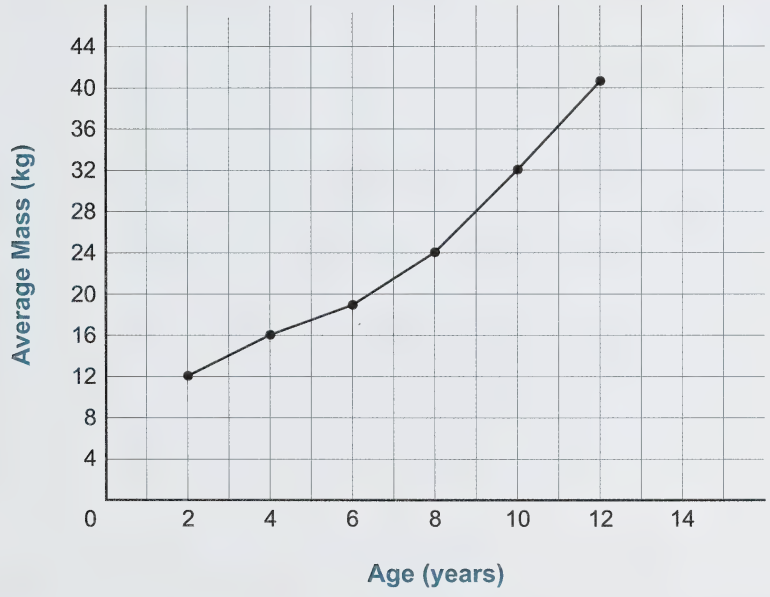
3. **a.** Chart 2 and Chart 3 both show how far Columbus travelled each day, and both use a scale that goes up by tens. Chart 2 uses bars of different lengths, and Chart 3 has line segments joining the points that represent the number of leagues that Columbus travelled each day.

   b. Chart 8 and Chart 9 both show how far Columbus travelled each week. Chart 8 uses a scale that goes up by 25s, but Chart 9 uses a scale that goes up by 50s. Chart 9 has line segments joining the points that represent the number of leagues that Columbus travelled each week.

4. **Textbook, Page 176, Skill Bank from This Unit, question 4**

   4. a. Many of the masses are multiples of 4, so that is a good way to label the graph.

   b.



Activity 3

1. **a.** The data in the pictograph on page 150 tells you how many books each person in the book club has read.

   b. Each sticker stands for one book that was read by the member.

2. **a.** The data displayed in this line plot tells you how many people read particular numbers of books.

   b. Each x stands for a particular member of the book club. It is written above the number of books that member has read.

3. Questions that you can answer by reading the pictograph but not the line plot must refer to the names of the children.

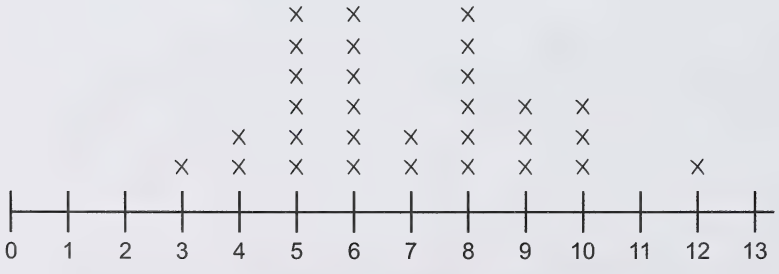
   - Did Jordana read more books than Charles?
   - How many books did Sheeva read?
   - Who read the most books?
   - Which club members read the same number of books?

4. Questions that you can answer by reading either the line plot or the pictograph are

   - How many members are there in the book club?
   - What is the least number of books read by a club member?

5. Questions that you can answer more easily by reading the line plot are

   - How many members read 20 books?
   - How many members read more than 10 books?
   - Did most of the members read at least 15 books?
   - What was the most frequently read number of books?

6. 

Number of Tied Games (up to February 9, 2001)

7. **a.** The least number of games tied by any NHL team was 3.
   b. One team had three tied games.

8. **a.** The greatest number of tied games any NHL team had was 12.
   b. One team had 12 tied games.

9. Fifteen teams had more than six tied games.

10. One team tied more games than the Flames.

11. Twenty-six teams tied fewer games than the Flames.

12. Two other teams had the same number of tied games as the Flames.

13. Fifteen games ended in a tie. The total number of ties shown on the line plot is 30. Since every game is played by two teams, the number of tie games is half of 30.

Challenge Activity

It took six days to reach the port. If they sailed 10 leagues towards the port each day and then were blown back 2 leagues, that means they were 8 leagues closer to the port each day.

Day 1: 50 leagues – 8 leagues = 42 leagues to go
Day 2: 42 leagues – 8 leagues = 34 leagues to go
Day 3: 34 leagues – 8 leagues = 26 leagues to go
Day 4: 26 leagues – 8 leagues = 18 leagues to go
Day 5: 18 leagues – 8 leagues = 10 leagues to go
Day 6: 10 leagues to the port They've made it!

Lesson 2: Selecting a Sample

Activity 1

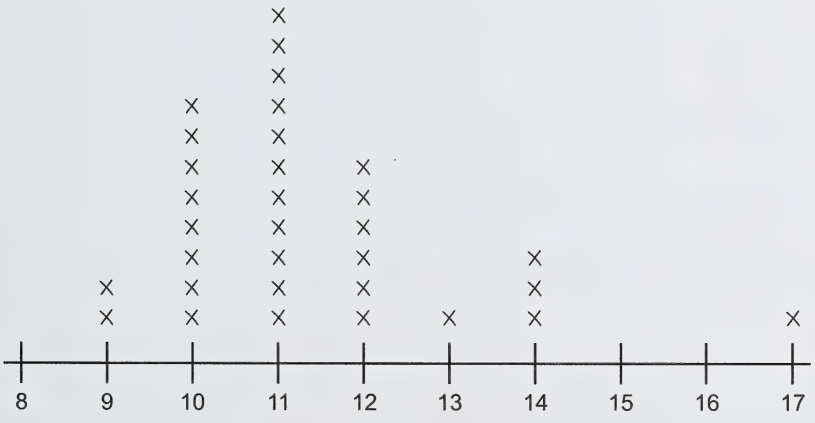
Answers to questions 1 to 6 will vary, depending on the sizes of the potatoes used. Sample answers, based on the data in the following table, are given.

1.

Potato Number	Length (nearest cm)	Circumference at Middle (nearest cm)	Mass (nearest 10 g)
1	14	21	300
2	13	17	170
3	11	16	140
4	12	19	210
5	12	18	170
6	10	15	90
7	11	16	120
8	14	19	240
9	11	16	130
10	10	17	130
11	12	17	140
12	11	16	120
13	12	15	130
14	9	14	80
15	12	20	190
16	12	18	170
17	14	18	200
18	10	16	100
19	17	21	330
20	11	15	110
21	11	17	140

22	11	16	140
23	10	15	110
24	10	16	110
25	10	16	110
26	11	17	140
27	11	17	150
28	11	16	140
29	10	16	110
30	11	18	160
31	10	17	120
32	9	14	90

2. a. Potatoes are organized by length on the following line plot.

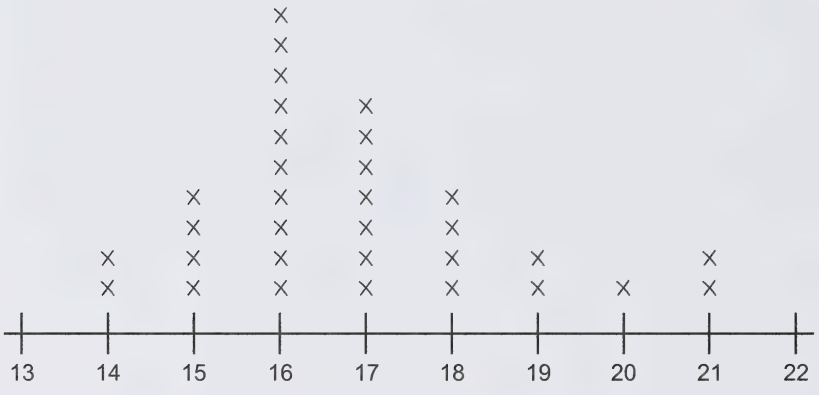


Length of Potatoes (cm)

b. The three groups of potatoes, based on their lengths, are shown below. Most of the lengths are clustered around 11 cm, so the ranges were chosen to make three groups with one group higher and one group lower than the cluster.

Size	Range of Length (cm)	Number of Potatoes in Group
Small	9–10	10
Medium	11–12	17
Large	13–17	5

3. a. Potatoes are organized by circumference on the following line plot.

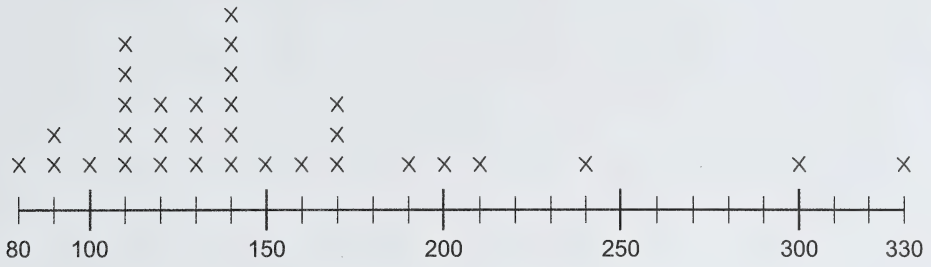


Circumference of Potatoes (cm)

b. The three groups of potatoes based on their circumferences are shown. Most of the circumferences clustered around 16 cm, so the ranges were chosen to make three groups with one group higher and one group lower than the cluster.

Size	Range of Circumference (cm)	Number of Potatoes in Group
Small	14–15	6
Medium	16–17	17
Large	18–21	9

4. a. Potatoes are organized by mass on the following line plot.



Mass of Potatoes (to nearest 10 g)

b. The three groups of potatoes, based on their masses, are shown. Most of the masses clustered around 140 g, so the ranges were chosen to make three groups with one group higher and one group lower than the cluster.

Size	Range of Mass (g)	Number of Potatoes in Group
Small	80–110	9
Medium	120–160	14
Large	170–330	9

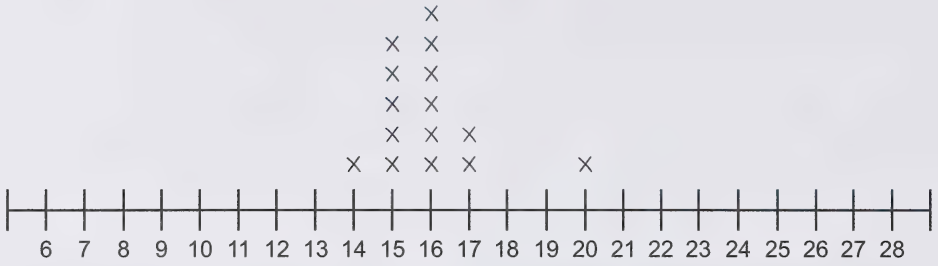
Activity 2

1. This is a good sample of the temperatures in the population because it includes centres from across most of Alberta.

2. Jim should suggest that Ann tour Alberta in July because that is when the temperatures are warmest. For every centre in the sample, July has the greatest average temperature.

3. a. The average temperatures for July are shown on the following line plot.

AVERAGE JULY TEMPERATURES (°C)
FOR ALBERTA CENTRES SAMPLED



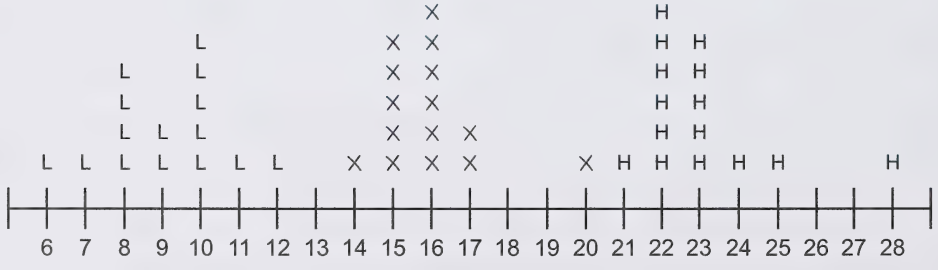
b. The average temperature for July that occurs most often in the sample is 16°C.

c. No, only six of the 15 centres in the sample have that average temperature.

d. Three centres have an average July temperature greater than 16°C, and six centres have an average July temperature less than 16°C.

4. a. The average high and low July temperatures for the centres are shown in the following line plot.

AVERAGE JULY TEMPERATURES (°C)
FOR ALBERTA CENTRES SAMPLED



b. The average monthly temperatures (the ones you plotted with Xs in question 3) are misleading. In most places throughout the province in July, you can expect temperatures of 22°C or 23°C during the day, but the temperature falls to between 8°C to 10°C at night.

5. **a.** The line plot shows the 12 average monthly temperatures for Red Deer, placed in rank order, from least to greatest.

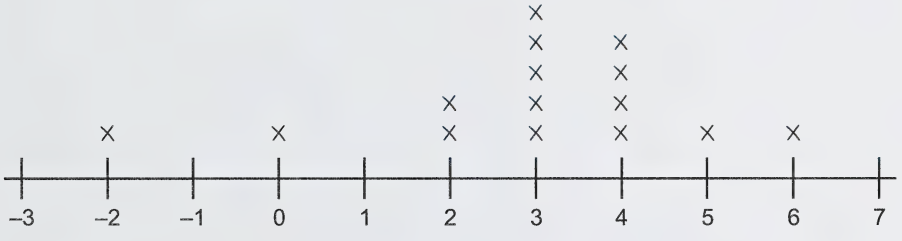
   b. This is not useful information because you don't know which temperatures go with which months, and no temperature ever repeats.

6. **a.** The broken-line graph shows which months have which average temperatures.

   b. It is useful because it gives a good picture of how the average temperatures change from month to month.

7. **a.** A line plot of the average yearly temperatures for the 15 centres is shown.

AVERAGE YEARLY TEMPERATURES (°C)
FOR 15 ALBERTA CENTRES



   b. No, this line plot is not a good display to put in a travel brochure for Alberta because it makes Alberta look like a cold place all year round. It does not show the range of monthly temperatures, nor does it show which centres have which average yearly temperatures.

Activity 3

1. The population Kassidy would want to collect data from to answer her question is all the Canadian coins currently in circulation.

2. No, all the coins from Kassidy's change purse would not be a good sample of the population because it is too small.

3. No, all the coins from Kassidy's piggy bank would not be a good sample of the population because it is too small and some coins may have been there for many years.

4. To find the number of years a coin had been in circulation, Kassidy subtracted the date on the coin from the present year.

5. Coins from the present year would be represented by zero years of circulation.

6. NUMBER OF YEARS IN CIRCULATION FOR A SAMPLE OF PENNIES, NICKELS, DIMES, AND QUARTERS

7.

	Current Year	1 to 10 Years	11 to 20 Years	21 to 30 Years	31 to 40 Years	Older Than 40 Years
Number of Coins	0	49	24	14	2	none

8. The number of coins still in circulation decreases quickly for each decade that you go back from the present year.

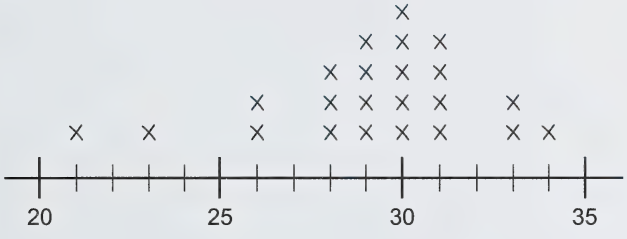
9. The oldest coin is a nickel that has been in circulation for 37 years.

10. Answers will vary.

11. Answers will vary.

Challenge Activity

1. HOW MANY SPICY PEANUTS ARE IN BOXES OF SNACKIES



2. Answers will vary. Sample answers are given.

   - How many boxes were sampled? (Answer: 23 boxes)
   - Of the boxes sampled, how many had 32 spicy peanuts in them? (Answer: No boxes)
   - Of the boxes sampled, how many had less than 28 spicy peanuts in them? (Answer: 4 boxes)

Lesson 3: Collecting Data from Experiments

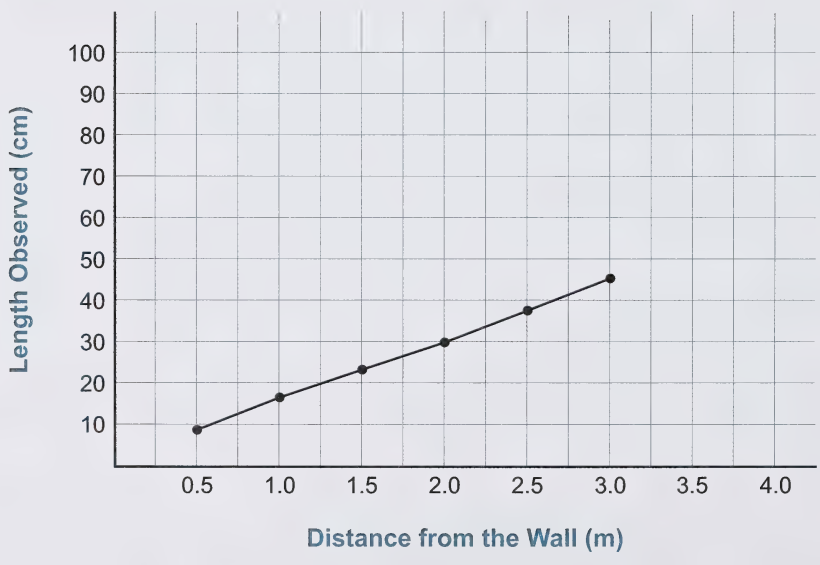
Activity 1

1. Answers will vary. Sample answers are given.

a.

Distance from Wall (m)	Length Observed (cm)
0.5	9
1.0	16
1.5	23
2.0	30
2.5	38
3.0	45

b.

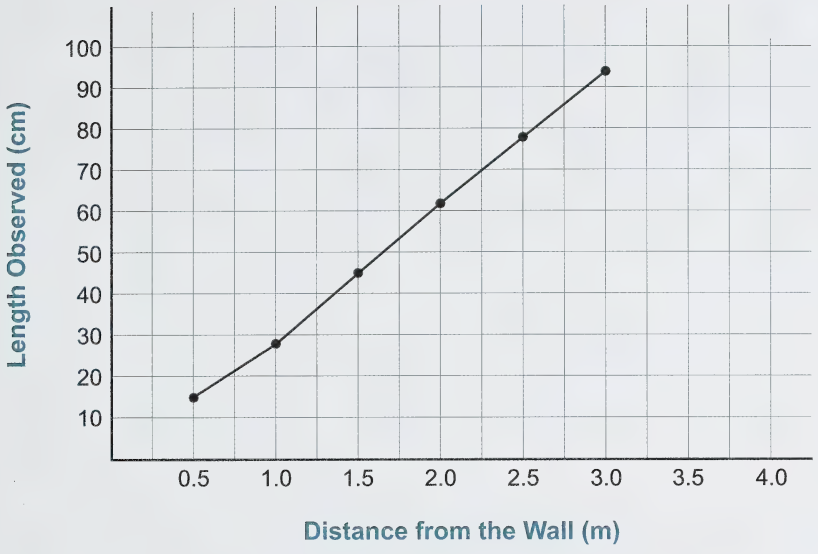


c. As you move farther away from the wall, you are able to see more of the metre-stick.

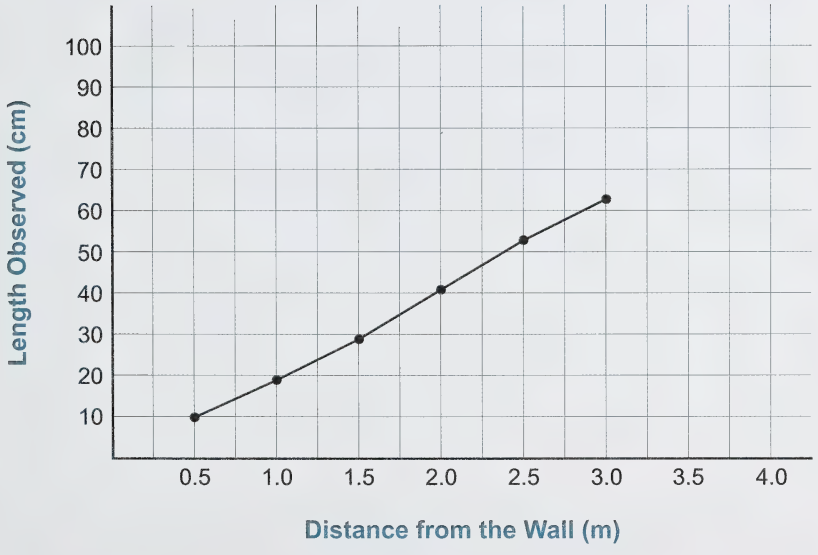
d. A broken-line graph is appropriate because you get a picture of how things change. How much of the metre-stick you can see changes as you change your distance from the wall.

2.

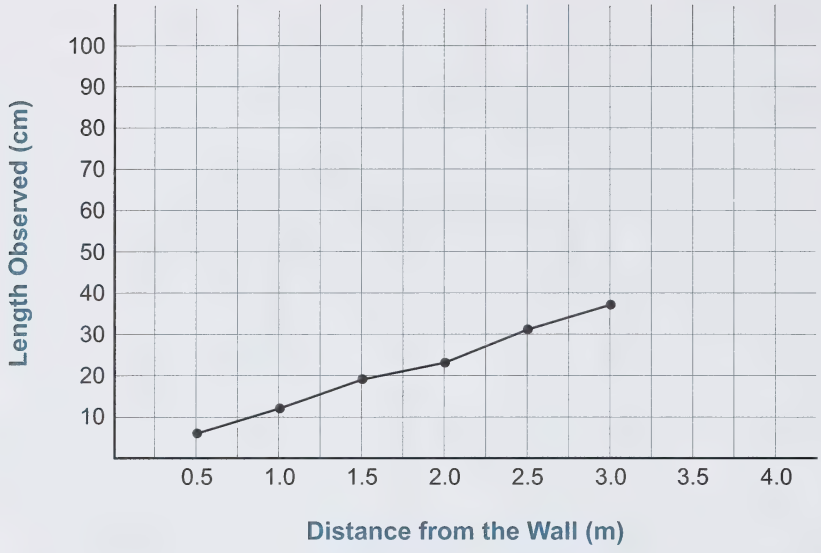
SET 1


Length Observed (cm)
100
90
80
70
60
50
40
30
20
10
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
Distance from the Wall (m)

SET 2


Length Observed (cm)
100
90
80
70
60
50
40
30
20
10
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
Distance from the Wall (m)

SET 3



3. Answers will vary. A sample answer is given. An appropriate title is "How Much of the Metre-Stick You See."

4. **a.** The broken-line graph for Set 3 is most like the broken-line graph in question 1.b. because they are at about the same amount of tilt or steepness.

   b. Tube B was most likely used because it is the same size as a paper towel tube.

5. If you used the tube for Set 1 and stood 1.75 m from the wall, you might see about 55 cm. First, locate 1.75 m on the Distance from the Wall axis. Next, go straight up and put a dot at the point where you reach the line segment. Then, go straight left until you reach the Length Observed axis and read the value.

6. If you used the tube for Set 2, you would have to stand 5 m from the wall to see the entire metre-stick. Two strategies for finding the answer follow:

   - Each time you move back 1 m, you see about another 20 cm. At 3 m, you see 63 cm, so to see another 40 cm, you would have to move back another 2 m from the 3-m point.

   - Extend the line in the graph for Set 2 until it crosses the horizontal line that represents 100 cm. Put a dot at that point and go straight down to the Distance from the Wall axis and read the value.

7. If you used the tube for Set 3, you would see about 49 cm if you stood 4 m from the wall. Two strategies for finding the answer follow:

   - Each time you move back 1 m, you see about another 12 cm. At 3 m, you see 37 cm, so if you move back 1 m from that point, you would see about another 12 cm.

   - Extend the line in the graph for Set 3 until it crosses the vertical line that represents 4 m. Put a dot at that point and go straight left to the Distance from the Wall axis and read the value.

8. Set 3 is closest to the data you obtained in question 1, so Set 3 used Tube B, Set 1 used Tube A, and Set 2 used Tube C.

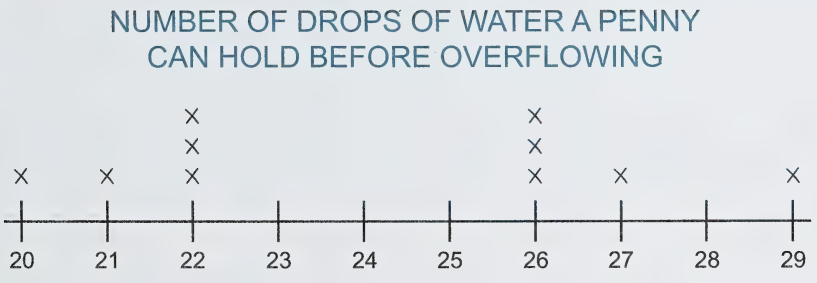
Activity 2

1. **a.** Answers will vary.

   b.

Penny Trial Number	1	2	3	4	5	6	7	8	9	10
Number of Drops	22	26	21	22	22	26	29	27	20	26

   c.



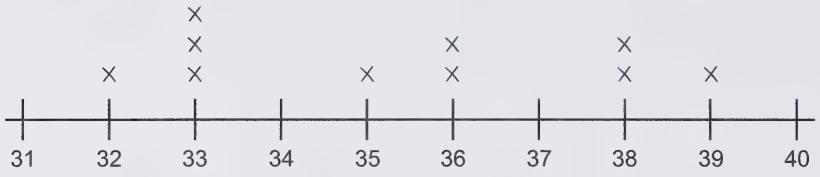
2. **a.** Answers will vary.

   b.

Nickel Trial Number	1	2	3	4	5	6	7	8	9	10
Number of Drops	36	33	38	39	32	33	38	33	36	35

c.

NUMBER OF DROPS OF WATER A NICKEL CAN HOLD BEFORE OVERFLOWING



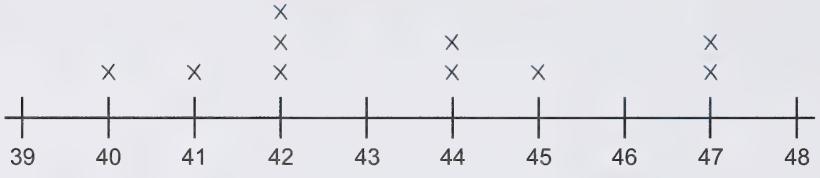
3. a. Answers will vary.

b.

Quarter Trial Number	1	2	3	4	5	6	7	8	9	10
Number of Drops	44	45	47	41	40	42	47	42	42	44

c.

NUMBER OF DROPS OF WATER A QUARTER CAN HOLD BEFORE OVERFLOWING



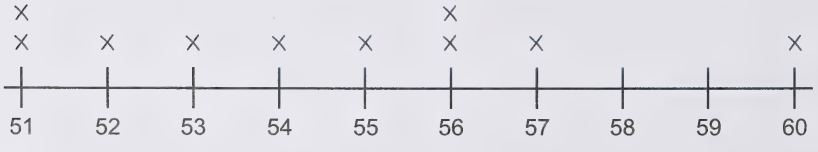
4. a. Answers will vary.

b.

Loonie Trial Number	1	2	3	4	5	6	7	8	9	10
Number of Drops	53	51	56	51	55	56	60	57	52	54

c.

NUMBER OF DROPS OF WATER A LOONIE CAN HOLD BEFORE OVERFLOWING



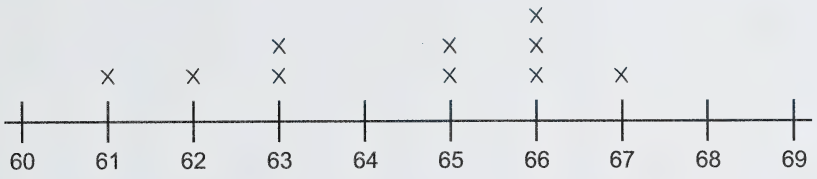
5. a. Answers will vary.

b.

Toonie Trial Number	1	2	3	4	5	6	7	8	9	10
Number of Drops	62	66	61	67	63	63	65	65	66	66

c.

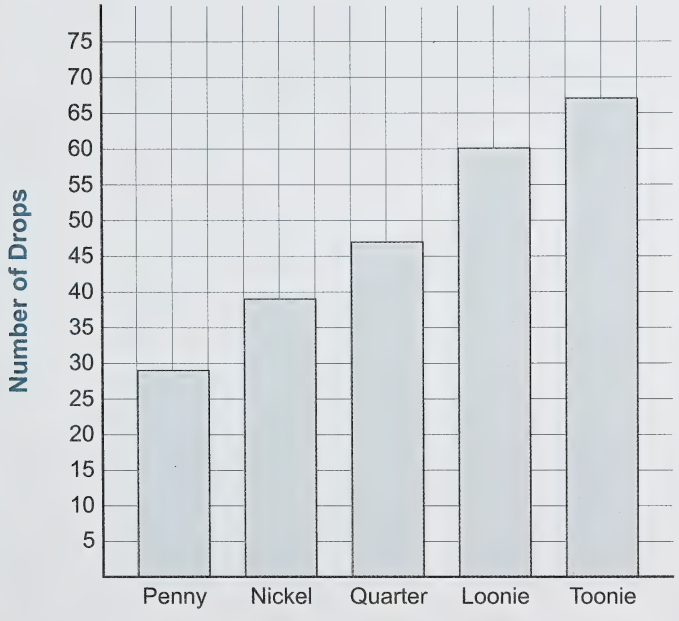
NUMBER OF DROPS OF WATER A TOONIE CAN HOLD BEFORE OVERFLOWING



6. You might compare the greatest number of drops rather than the most frequent number of drops because two or more different values might have the same frequency.

7.

GREATEST NUMBER OF DROPS OF WATER THAT COINS CAN HOLD



8. There is a relationship between how the coins stack on top of one another and the bars in the graph in question 7. The penny fits just inside the nickel, the nickel fits just inside the quarter, the quarter fits just inside the loonie, and the loonie just fits inside the toonie. In the bar graph, the bars seem to increase in height by about the same amount each time for each larger coin.

9. **a.** Just before it overflowed, the water formed a dome on top of the coin.

   b. Answers will vary. A sample answer is given.

   I was surprised at how much water the coins could hold. I didn't think the water would stick together like that and rise so high before it overflowed.

Activity 3

Answers will vary. Sample answers are given.

1.

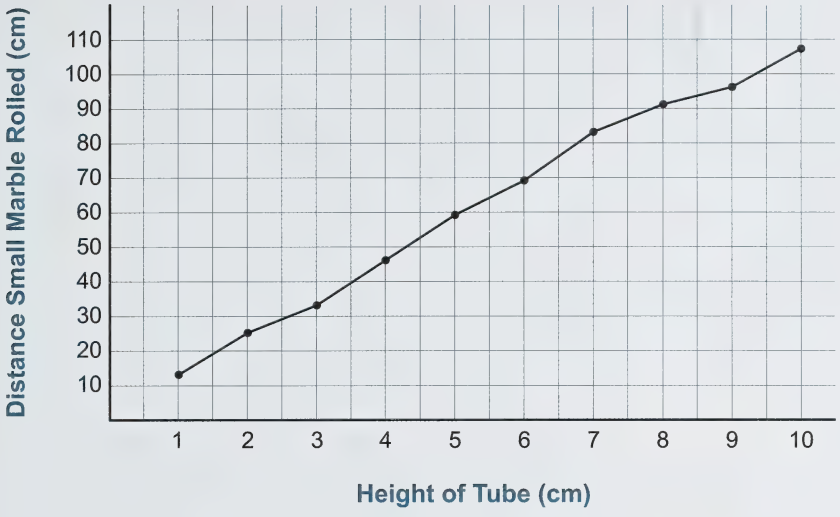
Number of Flats Used to Raise Tube	1	2	3	4	5	6	7	8	9	10
Distance Small Marble Rolls (cm)	13	25	33	46	59	69	83	91	96	107

2.

Number of Flats Used to Raise Tube	1	2	3	4	5	6	7	8	9	10
Distance Large Marble Rolls (cm)	18	28	52	65	83	99	110	130	131	145

3.

DISTANCE THE SMALL MARBLE ROLLED
WHEN THE HEIGHT WAS CHANGED



4.

DISTANCE THE LARGE MARBLE ROLLED
WHEN THE HEIGHT WAS CHANGED

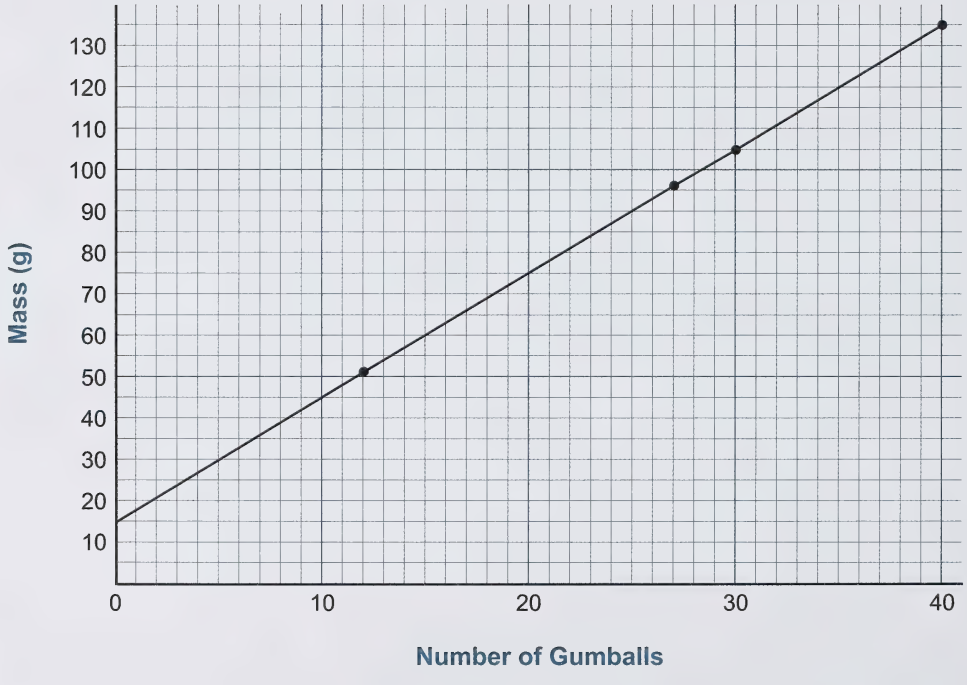
5. Answers will vary. A sample answer is given.

- The higher the end of the tube was raised, the farther the marble rolled. When the height is increased by equal amounts, the distance the marble rolls increases in a similar way.

- The heavier marble rolled farther than the lighter marble.

Challenge Activity

The mass of the empty container is 15 g. Plot the ordered pairs $(40, 135)$, $(30, 105)$, $(27, 96)$, and $(12, 51)$. Draw a line through the points with a ruler and extend the line to where the number of gumballs is zero. That tells you the mass of the empty container.



Keystrokes

1. All of the following answers were obtained using a basic four-function calculator with an eight-digit display.

   a. You can press the = key 15 more times, for a total of 25 times before an error message appears on the display.

=	=	=	=	=	=	=	=
4096	8192	16384	32768	65536	131072	262144	524288

=	=	=	=	=	=	=	=
1048576	2097152	4194304	8388608	16777216	33554432	67108864	E

   b. When you multiply by 3, you can press the = key 15 times before an error message appears on the display.

Keystrokes	ON/C	3	×	=	=	=	=	=	=	=	=
Display	0	3	3	9	27	81	243	729	2187	6561	19683

=	=	=	=	=	=	=	=
59049	177147	531441	1594323	4782969	14348907	43046721	E

   The following table shows the number of times the = key can be pressed for the numbers 4 through 12.

Number Multiplied	3	4	5	6	7	8	9	10	11	12
Number of Times = Key Is Pressed	15	12	10	9	8	7	7	6	6	6

c. The number of times you can press the = key is getting less and some of the numbers are starting to repeat.

13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
6	5	5	5	5	5	5	5	5	4	4	4	4	4	4	4	4	4

d. The least number for which you can press the = key only three times is 40.
The least number for which you can press the = key only two times is 100.
The least number for which you can press the = key only one time is 465.
The least number for which you can press the = key no times is 10 000.

2. a. The total number of boxes of cookies sold was 3605.

Keystrokes	ON/C	2	×	55	M+	7	×	70	M+	6	×	75	M+
Display	0	2	2	55	110	7	7	70	490	6	6	75	450

3	×	80	M+	4	×	85	M+	5	×	90	M+	3	×	100	M+	4
3	3	80	240	4	4	85	340	5	5	90	450	3	3	100	300	4

×	105	M+	2	×	110	M+	3	×	115	M+	2	×	120	M+	MRC
4	105	420	2	2	110	220	3	3	115	345	2	2	120	240	3605

b. The total number of people who swam at the pool in January is 1230.

Keystrokes	ON/C	2	×	29	M+	4	×	32	M+	2	×	34	M+
Display	0	2	2	29	58	4	4	32	128	2	2	34	68

6	×	37	M+	4	×	39	M+	3	×	42	M+	2	×	44	M+	4
6	6	37	222	4	4	39	156	3	3	42	126	2	2	44	88	4

×	45	M+	2	×	48	M+	2	×	54	M+	MRC
4	45	180	2	2	48	96	2	2	54	108	1230

c. The total number of strawberries in the baskets at the farmers' market is 3038.

Keystrokes	ON/C	2	×	51	M+	3	×	52	M+	2	×	53	M+
Display	0	2	2	51	102	3	3	52	156	2	2	53	106

4	×	54	M+	6	×	55	M+	7	×	56	M+	4	×	57	M+	6
4	4	54	216	6	6	55	330	7	7	56	392	4	4	57	228	6

×	58	M+	5	×	59	M+	3	×	60	M+	4	×	61	M+	2	×
6	58	348	5	5	59	295	3	3	60	180	4	4	61	244	2	2

62	M+	3	×	63	M+	2	×	64	M+	MRC
62	124	3	3	63	189	2	2	64	128	3038

Review

1. a. Phoenix, AZ, has the highest mean June high temperature.

b. Corner Brook, NF; Miami, FL; Toronto, ON (city); and Yellowknife, NT, have a 10°C difference.

c. Iqaluit, Nunavut, has the least difference between its mean June high temperature and its mean June low temperature.

d. The difference between Calgary's mean June high temperature and its mean June low temperature is 13°C.

2. a. The annual sales were the greatest in 1994. The amount was about $3.7 million.

b. The annual sales were the least in 1984. The amount was about $2.8 million.

c. The difference between the sales for 1984 and 1994 was about $0.9 million = $900 000.

d. The annual sales were greater than the previous year in 1985, 1986, 1988, 1992, 1993, and 1994.

3. **a.** Mauna Loa is the greatest number of metres above sea level.

   b. Keniuji is the least number of metres above sea level.

   c. Three volcanoes have the most recent major eruptions shown: Mt. St. Helens, Kilauea, and Mauna Loa all erupted in 1984.

   d. The most years have passed since Haleakala's last major eruption.

4. **a.** The New York Rangers went the most years without winning.

   b. Two teams, Los Angeles and Pittsburgh, went the least years without winning.

   c. Chicago has gone nine more years without winning than Toronto has.

   d. The New York Rangers have gone more than twice as many years without winning than two teams, Los Angeles and Pittsburgh.

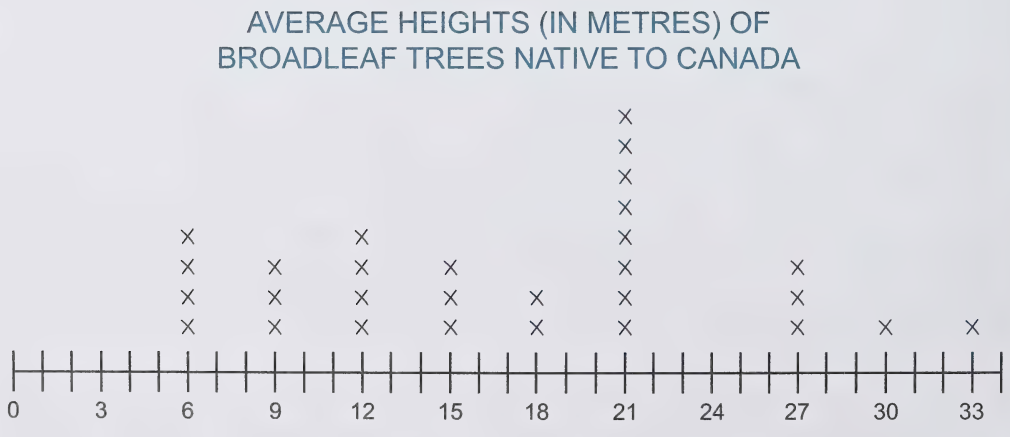
5. **Textbook, page 176, Skill Bank from This Unit, question 1**

   1. **a.** The range is 27 m: 33 m – 6 m = 27 m

      b. Answers may vary. A sample answer is given.

      Since all the heights are multiples of 3 m, that is a good way to label the number line.

      c.



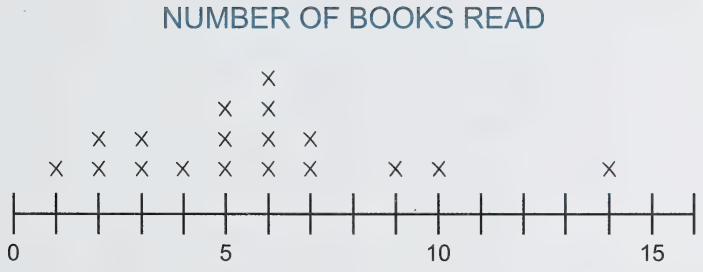
6. Textbook, page 223, Skill Bank Looking Back, question 1

1. a.

b. The line plot could help the company know when most employees are likely to retire.

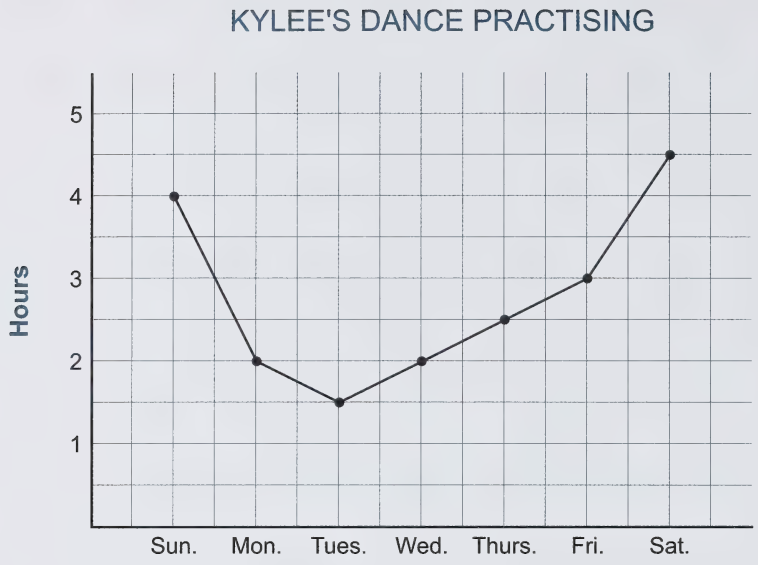
7. Textbook, page 197, Skill Bank Looking Back, question 6

6.



8.

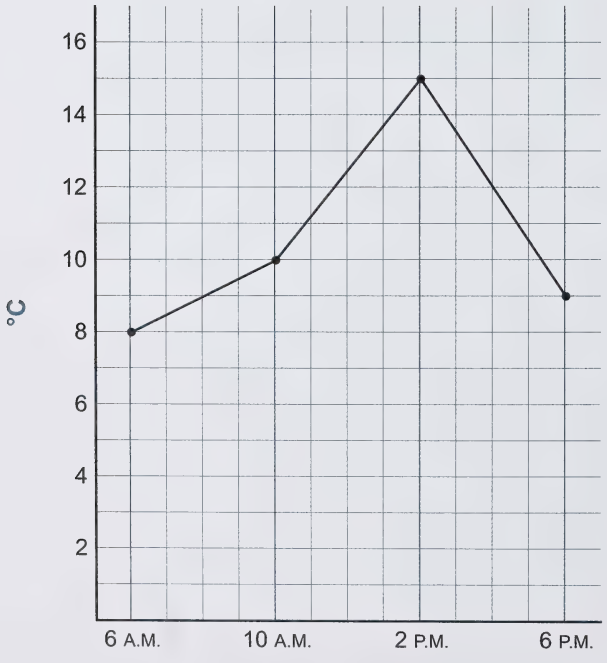
9. a.



b. Kylee practised more hours on the weekend than through the week. Her practice time on Tuesday took a small dip from Monday. After Tuesday, her practice time increased every day up to Saturday, when she practised the most hours.

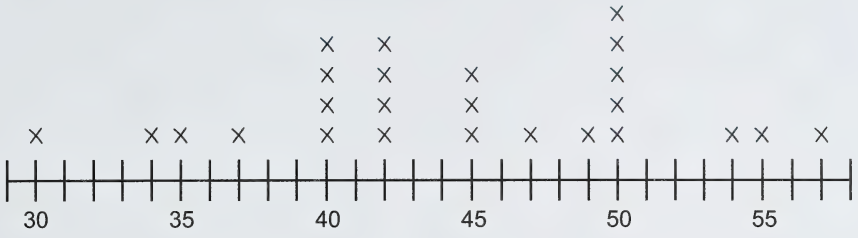
10. Textbook, Page 197, Skill Bank Looking Back, question 5

5.



11. a. The prices rounded to the nearest dollar are \$30, \$34, \$37, \$37, \$40, \$42, \$45, \$50, \$47, \$49, \$50, \$50, \$50, \$55, and \$60.

PRICES OF VIDEO GAMES



Prices Rounded to Nearest Dollar

b. The population for which Victor wanted to collect data is all the video games that are available.

c. Victor's sample is appropriate because the ad probably included a variety of available games.

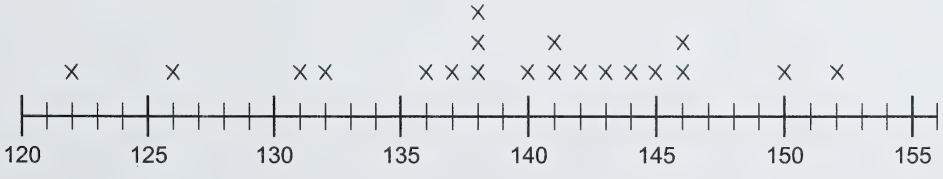
d. Victor's line plot shows that most of the video games cost between \$40 and \$50.

12. a. Answers will vary. A sample answer is given.

This is a good sample because most children in Grade 5 are about ten years old.

b.

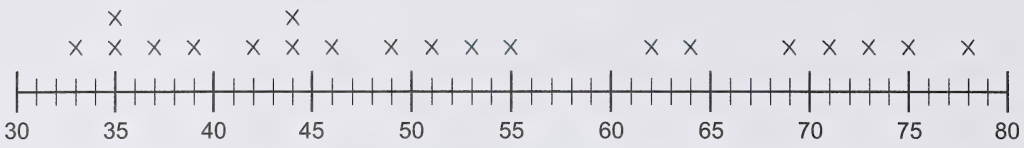
HEIGHTS OF STUDENTS (IN CENTIMETRES)
IN A GRADE 5 CLASS



c. The most frequent height in the sample is 138 cm.

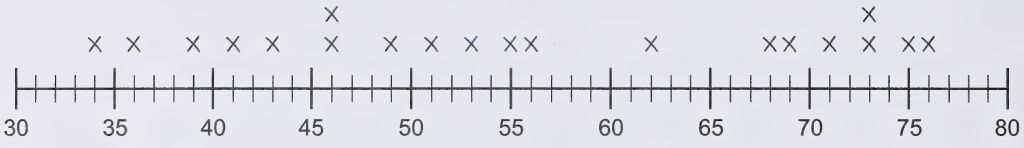
13. a.

SHARKS' FOOT RACE



Time in Seconds

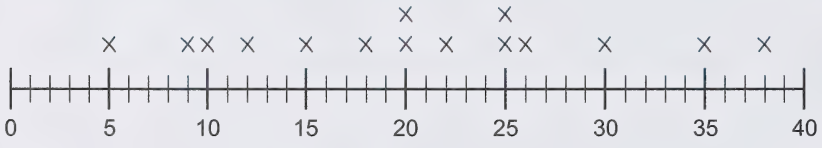
DOLPHINS' FOOT RACE



Time in Seconds

b. The middle point for both line plots is 55 sec. The sharks have more times that are faster than 55 sec than do the dolphins. This tells me that the sharks are faster.

14. a. TIME (IN MINUTES) IT TAKES US TO GET TO SCHOOL



b. Two times have a frequency of two people: 20 s and 25 s.

c. The range of times is 33 s: $38\ \text{s} - 5\ \text{s} = 33\ \text{s}$.

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